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THE INSTITUTION OF PRODUCTION ENGINEERS

VOL. XXVII

No. 4

April, 1948



Contents :

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THE GAP BETWEEN THE PRODUCTION
ENGINEER AND THE MANAGER

by W. C. PUCKEY, M.I.P.E., F.I.I.A.

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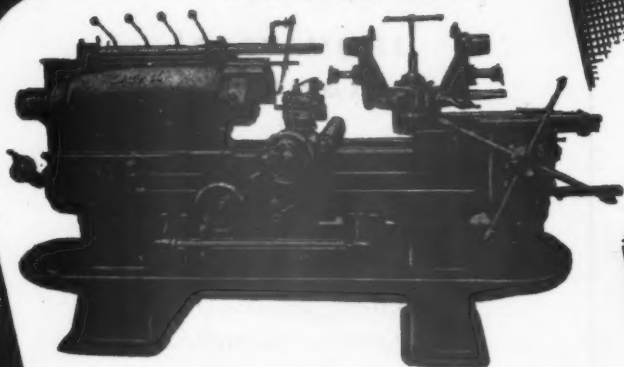
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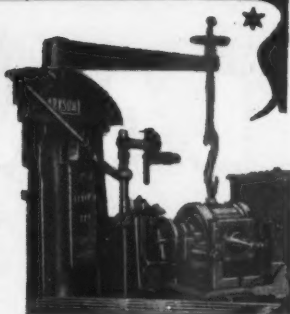
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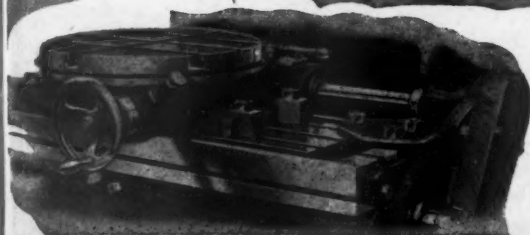
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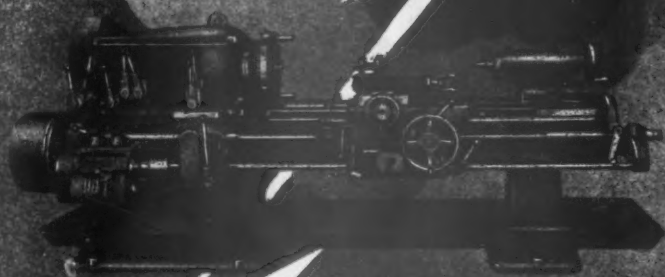
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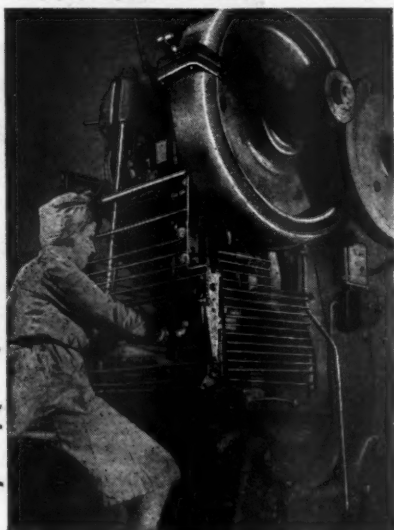
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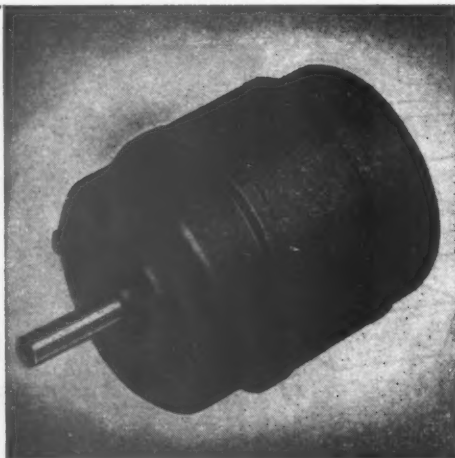
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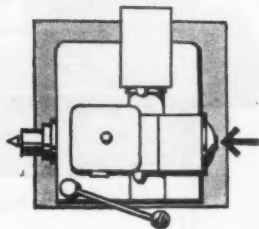
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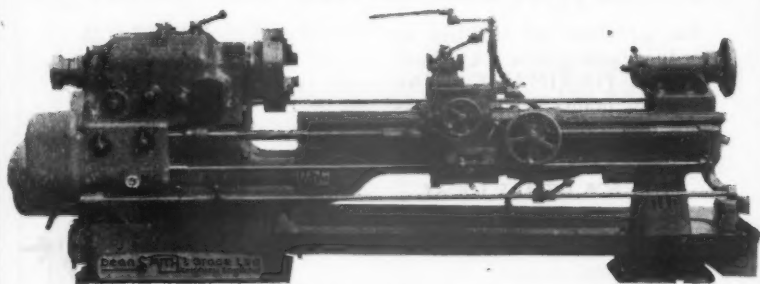


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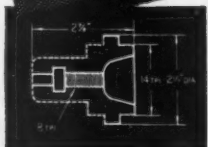
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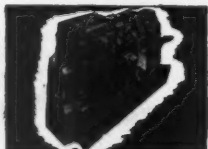
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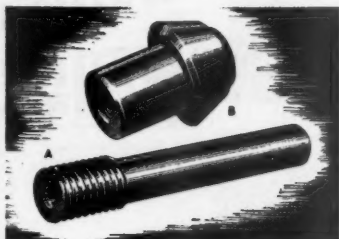


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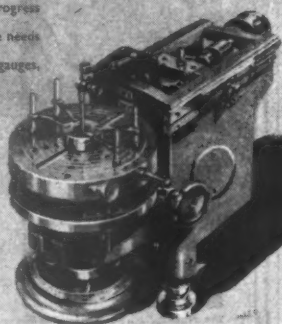
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MR. J. T. KENWORTHY, M.I.P.E.

Institution Personalities — 2.



MR. J. T. KENWORTHY, M.I.P.E.

MR. J. T. KENWORTHY, M.I.P.E.

Mr. J. T. Kenworthy, M.I.P.E., Member of Council and one of the Founder Members of the Institution, took an outstanding part in organising the vital production drive in the aero-engine field during the war years. In his position as Technical Liaison and Co-ordination Officer to a group of Midland factories operating under a Government shadow scheme from 1936 to 1945, he was largely responsible for maintaining the flow of components so urgently needed for successful air operations.

During this period he also became a member of the Ministry of Supply Diamond Tool Technical Panel which, during its existence, issued in conjunction with the British Standards Institution established standards for shaped diamond tools for boring and turning, and two reports on the use of shaped diamond tools for external and internal machining of aluminium alloys. Mr. Kenworthy is a strong advocate of the desirability of standardisation as a necessary aid to production, and represents the Institution on a number of B.S.I. Technical Committees.

On the conclusion of hostilities and the subsequent closing down of the shadow industry, he returned to the parent company, the Bristol Aeroplane Company, as Chief Quality Observer of the Engine Division, which position he now holds.

He was apprenticed to the machine tool trade, and received his technical training through evening classes at Rochdale Technical School. On completing his apprenticeship, he followed the then traditional practice of obtaining experience elsewhere, turning his attention to gear cutting, and after acting as foreman of gear cutting departments in a number of factories for some years, in 1919 he was appointed Production Engineer in a factory producing motor vehicles.

In 1929 he transferred his interests to inspection of aero-engines, in which sphere he remained until going to the Midlands in 1936.

Since its early days, Mr. Kenworthy has done valuable work for the Institution, particularly in the education field. He was largely instrumental, with a few other members, in inaugurating the Western Section of the Institution in 1933, and acted as Honorary Secretary until the end of 1936. He was President of this Section from 1940-1942, and has been a Member of Council since 1940.

His keen interest and ability in education matters led to him becoming a member of the Education Committee and Joint

MR. J. T. KENWORTHY, M.I.P.E.

Examination Board in 1940, and of the Membership Committee in 1943. He was Chairman of the Education and Membership Committees for two years until June, 1946, when he unfortunately had to resign owing to health reasons.

He is a strong advocate of the necessity of technical training to Higher National Certificate standard, together with practical training as a background for corporate membership of the Institution. It is largely due to his efforts that an Education Officer was recently appointed to the Institution, to foster the interests of Student and Graduate Members.

INSTITUTION NOTES

April, 1948

COUNCIL MEETING The next meeting of Council will be held on April 22nd, 1948, at the British Standards Institution, 28, Victoria Street, London, S.W.1, at 11.0 a.m.

EMPLOYMENT FOR BLIND ENGINEERS The Institution has been approached by St. Dunstan's in order to elicit its help on behalf of those who are suffering from blindness as a result of war. The Council feels that every effort should be made by our members to further this very noble cause.

It was in April, 1941, that St. Dunstan's first arranged for a war-blinded man to be employed in industry, with the object of helping the war effort. He was followed by scores of others who had been specially trained as craftsmen in trades normally practised by blind people. These men readily adapted themselves to their new tasks.

They gave invaluable assistance in the difficult labour situation by releasing workers for other jobs which could not be done without sight. Over 250 young St. Dunstaners have had special industrial training, and have been placed in jobs throughout the country. They operate bar capstan lathes, and on these they are trained progressively on various machines in St. Dunstan's Training Centre; some work a 50-ton plastic press, others operate different types of routers; many have qualified in assembly work and as gaugers, and for other occupations outside the engineering field.

Many of these men are now helping the export drive, and St. Dunstan's is confident that many others can do so if given the opportunity. There are blinded men of both wars who make domestic articles, and while they are not fit enough to take their places in a factory, they can work in their own workshops at home, so making valuable contributions to the national effort to advance our export volume.

It is felt that many employers may welcome the help of such workers with small assemblies or repetition work, and St. Dunstan's experts would be glad to examine the situation with production executives where work for sightless people can be undertaken by those living in the vicinity. Mr. Harry Bennett, Home Industries Superintendent of St. Dunstan's, 191, Marylebone Road, London, N.W.1, would be grateful to hear from any members of the Institution who are prepared to consider this scheme, which it is felt deserves as much support as possible.

I.E.S. SUMMER MEETING The Illuminating Engineering Society has arranged to hold a Summer Meeting to take place from June 16-19th, 1948.

The programme includes a number of papers dealing with subjects of interest not only to lighting engineers but also to users of lighting. Advance copies of papers which will be presented and discussed will be available shortly before the meeting.

Any members of the I.P.E. will be welcome at this meeting, and application should be made to Mr. G. F. Cole, Secretary, Illuminating Engineering Society, 32, Victoria Street, London, S.W.1., for full particulars.

NEWS OF MEMBERS

Mr. A. J. Bull, Grad.I.P.E., is now Development Engineer in charge of Design at the Plessey Company, Ltd., Ilford, Essex.

Mr. W. H. Crawshaw, Grad.I.P.E., has now been demobilised and has taken up the position of Production Manager with Messrs. Whiteley (Rishworth), Ltd., Rishworth, Halifax.

Mr. D. J. Hartshorn, Int.A.M.I.P.E., is now Machine Tool Designer with Messrs. Fischer Bearings Co., Ltd., Wolverhampton.

Mr. George Harrison, Grad.I.P.E., has now left the United Kingdom to take up an appointment as Technical Engineer Assistant and Project Draughtsman with the Dryden Engineering Co., Ltd., Johannesburg.

Mr. A. Hazell, B.Sc., A.M.I.P.E., has joined the staff of Messrs. W. Mills, Friar Park Works, Wednesbury.

Mr. L. J. Hearn, Stud.I.P.E., has been appointed as a Designer Draughtsman with Messrs. Cyril Kieft & Co., Ltd., Bridgend, Glamorgan, S. Wales.

Mr. H. Heselton, A.M.I.P.E., F.I.F.M., has resigned his position as Works Manager of Messrs. Block and Anderson, Ltd., and is now operating as a Technical Consulting Engineer.

Mr. W. N. Job, M.I.P.E., has taken up the post of Plywood Mill Manager of the African Timber & Plywood Company, Timber H.Q., Sapele, Nigeria.

Mr. W. W. MacArthur, M.I.P.E., has resigned from the Fairey Aviation Co., Ltd., and is now Managing Director of Messrs. Air Ducts, Ltd.

Mr. John L. Price, A.M.I.P.E., has received confirmation of his appointment to the Engineering Staff of the United Africa Co., working in Tanganyika on the East African Groundnut Scheme.

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Mr. G. Smithies, A.M.I.P.E., is now Assistant Manager, Experimental Department, Messrs. Turner Bros. Asbestos Co., Rochdale, Lancashire.

Mr. G. S. Thurley, M.I.P.E., is now established in business on his own account, with British Commonwealth Agencies, for mechanical equipment for the permanent way.

OBITUARY The Institution deeply regrets to announce the deaths of the following members : Mr. F. R. Barratt, M.I.P.E., of South Africa ; Mr. J. Rankin, M.I.P.E., and Mr. T. H. Galbraith, M.I.P.E., both of Manchester Section.

VISITOR FROM ABROAD An interesting visitor to the United Kingdom from Pretoria, South Africa, is Major J. R. Nortier, M.B.E., Int.A.M.I.P.E., M.Inst.W., of the South African Permanent Force.

The object of Major Nortier's visit, as a member of the Union Defence Force Selection Board, is to recruit physically fit skilled and qualified ex-Army R.A.F. tradesmen and technical storemen for the Technical and "Q" Services Corps—Land Forces—of the South African Permanent Force.



Major J. R. NORTIER.

Major Nortier, who is 32 years of age, was educated at the Oudtshoorn Boys' High School and the Port Elizabeth and Pretoria Technical Colleges, where he gained Higher National Certificates in Mechanical and Electrical Engineering.

After matriculation he was indentured to the Oudtshoorn Municipality where he received training in Mechanical and Electrical Engineering and Drawing Office practice. He

specialised in gas and electric welding and its application to structural steel sections. He joined the Government Department of Irrigation in 1938 as a Mechanical Draughtsman.

In 1940 he was released for active service and joined the South African Engineering Corps. He was commissioned as a Mechanical

Engineer Officer in 1941, and during the next four years saw extensive service in Engineer Base Workshop Companies in Egypt and Italy.

In 1946 Major Nortier transferred from the Department of Irrigation to the South African Permanent Force, Department of Defence, as a Technical Officer on the staff of the Deputy Quarter-Master-General (Technical), General Headquarters, Pretoria.

SECTION MEETINGS

The following meetings have been arranged to take place in April and May, 1948. Where full details are not given, these have not been received at the time of going to press.

April

- 3rd LUTON AND DISTRICT GRADUATE SECTION. A lecture on "Research and Practice" will be given by Dr. D. F. Galloway, B.Sc.(Hons.), Wh.Sc., M.I.P.E., A.M.I.-Mech.E., A.M.I.E.E., at P.E.R.A. Laboratories, Melton Mowbray.
- 5th HALIFAX GRADUATE SECTION. A lecture on "Multispindle Automatic Machines" will be given by Mr. W. Ogilvie, M.I.Mech.E., M.I.P.E., and Mr. S. Ackrill, M.I.P.E., at the Technical College, Huddersfield, at 7-00 p.m.
- 7th NOTTINGHAM SECTION. A lecture on "Inspection" will be given at the Victoria Station Hotel, Milton Street, Nottingham, at 7-00 p.m.
- 8th LONDON SECTION. A lecture on "Some Aspects of Design and Production of Gunnery Control Gear" will be given by Mr. S. Parker, M.I.Mech.E., at the Lecture Hall, Royal Empire Society, Northumberland Avenue, W.C.2, at 7-00 p.m.
- 12th HALIFAX SECTION. In place of the lecture by Mr. B. McMahon, M.I.P.E., previously announced, a lecture on "Observations and Views on Heavy German Industry" will be given by Dr. H. P. Budgen at the White Swan Hotel, Halifax, at 7-00 p.m.
- 12th LUTON AND DISTRICT SECTION. A lecture on "Electrical Control Gear for Machine Tools" will be given by Mr. R. L. Paice, M.I.P.E., at the Igranic Electric Co., Ltd. Canteen at 7-15 p.m.
- 12th DERBY SUB-SECTION. A lecture on "Practical Approach of Research to Industry" will be given by Mr. H. W. Hobbs, M.I.P.E., at the Art School, Green Lane, Derby, at 6-45 p.m.
- 13th BIRMINGHAM GRADUATE SECTION. Members' Papers will be read at the James Watt Memorial Institute, Great Charles Street, Birmingham, at 7-15 p.m.

April—cont.

- 13th WOLVERHAMPTON GRADUATE SECTION. A lecture on "Centreless Grinding" will be given by Mr. R. J. M. Whibley, A.M.I.Mech.E., at the County Technical College, Wednesbury, at 7-15 p.m.
- 14th SHEFFIELD SECTION. A lecture on "Deep Drawing in Electro-Plate Industry" will be given by Mr. F. Parkinson at the Royal Victoria Hotel, Sheffield, at 6-30 p.m.
- 14th WOLVERHAMPTON SECTION. A lecture on "Cold Upsetting and Thread Rolling" will be given by Mr. T. C. Parker, M.I.P.E., at the Wolverhampton and Staffordshire Technical College, Wolverhampton, at 7-00 p.m.
- 14th LONDON GRADUATE SECTION. The Annual General Meeting and Social will be held at the Waldorf Hotel, Aldwych, W.C.2.
- 15th GLASGOW SECTION. A lecture on "Machine Tool Users' Difficulties" will be given by Mr. R. Taylor, M.I.P.E., at the Institution of Engineers and Shipbuilders in Scotland, 39, Elmbank Crescent, Glasgow, C.2, at 7-30 p.m.
- 15th LEICESTER SECTION. A lecture on "Corrosion of Metals" will be given by Mr. W. Murray, A.M.C.I., F.R.I.C., F.C.S., M.Inst.F., at the College of Technology, The Newarke, Leicester, at 7-00 p.m.
- 17th BIRMINGHAM GRADUATE SECTION. A visit has been arranged to Highley Colliery during the afternoon.
- 17th YORKSHIRE GRADUATE SECTION. A lecture on "Workmanship and Craft Skill" will be given by Mr. R. J. Mitchell, M.I.P.E., at The Midland Hotel, Bradford, at 2-30 p.m.
- 17th MANCHESTER SECTION. An all-day Conference on "National Production Needs—How they can be met" will take place in Manchester.
- 21st BIRMINGHAM SECTION. A lecture on "Cast Iron as an Engineering Material" will be given by H. T. Angus, Ph.D., M.Sc. (Development Manager of the British Cast Iron Research Association), at the James Watt Memorial Institute, Great Charles Street, Birmingham, at 7-00 p.m.
- 21st MANCHESTER SECTION. A lecture on "Some Practical Aspects of Gas Turbine Development" will be given by Mr. W. H. Darlington, M.Sc., D.I.C., A.M.I.Mech.E., A.F.R.Ae.S., at the College of Technology, Sackville Street, Manchester, at 7-15 p.m.

April—cont.

- 21st **LIVERPOOL SECTION.** The Annual General Meeting and Chairman's Address will take place at the Exchange Hotel, Liverpool, at 7-30 p.m.
- 21st **LUTON AND DISTRICT GRADUATE SECTION.** A Graduates' Evening will be held in the Lounge of the Midland Hotel, Luton, at 7-30 p.m.
- 23rd **HALIFAX GRADUATE SECTION.** A visit has been arranged to Messrs. Samuel Fox & Co., Ltd., Steel Works, Stocksbridge, near Sheffield, during the evening.
- 26th **YORKSHIRE GRADUATE SECTION.** A visit has been arranged to Messrs. Frederick Smith & Co. (Wire Mfgs.), Ltd., Halifax, for 7-00 p.m.
- 28th **LUTON AND DISTRICT GRADUATE SECTION.** The Annual General Meeting will take place at Luton Technical College at 7-30 p.m.
- 28th **EDINBURGH SECTION.** A lecture on "Compromises in Industry" will be given by Dr. H. B. Fraser at the North British Station Hotel at 7-30 p.m.

May

- 1st **HALIFAX GRADUATE SECTION.** A lecture on "The Manufacture of Gas Turbines" (including a sound film) will be given by Mr. H. Leedham, M.I.P.E., M.I.Mech.E., at the White Swan Hotel, Halifax, at 2-30 p.m., and will be preceded by a Luncheon and the Annual General Meeting.
- 5th **NOTTINGHAM SECTION.** A lecture on "Metal Finishing" will be given at the Victoria Station Hotel, Milton Street, Nottingham, at 7-00 p.m.
- 11th **WOLVERHAMPTON GRADUATE SECTION.** A lecture on "Fine Measurement" will be given by Mr. L. Wilcox, M.Sc., M.I.E.E., at the Wolverhampton and Staffordshire Technical College, Wolverhampton, at 7-15 p.m.
- 12th **WOLVERHAMPTON SECTION.** A lecture on "Metallurgical Factors Influencing Machinability" will be given by Mr. L. W. Johnson, M.I.P.E., at the Wisemore Schools, Walsall, at 7-00 p.m.
- 15th **YORKSHIRE GRADUATE SECTION.** The Annual General Meeting will be held at the Great Northern Hotel, Leeds.
- 27th **SHREWSBURY SUB-SECTION.** A lecture on "Powder Metallurgy" will be given by Mr. H. Greenwood.

RICHARD HAZLETON MEMORIAL LIBRARY

The Council of the Institution wishes to express its deep appreciation of the generous donations which have been made to the Richard Hazleton Memorial Library by those whose names appear below.

It is intended that this Library, which is being constituted as a permanent memorial to the Institution's first General Secretary, Richard Hazleton, will not only be a first-class reference library but will also provide an up-to-date information service concerning production problems, based on information obtained from all parts of the world.

The total amount required for this purpose is £4,000 and it is sincerely hoped that members will do their utmost to enable the Institution to reach this figure as soon as possible.

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THE HISTORY OF THE CITY OF BOSTON

From the first settlement of the city in 1630 to the present time. The city of Boston was founded by a group of Puritan settlers who came to the Massachusetts Bay in 1630. They were led by John Winthrop, who gave the city its name. The city grew rapidly and became one of the most important cities in the colonies. It was the site of the Boston Tea Party in 1773 and the Battle of Boston in 1775. The city was the center of the American Revolution and played a key role in the founding of the United States.

THE GAP BETWEEN THE PRODUCTION ENGINEER AND THE MANAGER

by W. C. PUCKEY, M.I.P.E., F.I.I.A.

*Presented to the London Section of the Institution of Production Engineers,
December 11th, 1947.*

This paper has one objective—it is this :—

To stress the importance of the productive function over the next few years ; to show its wide scope and to emphasise the desirability of having managers who are skilled in bringing out the best technique of production.

It is hardly necessary for me to remind you of the urgent need for more production. What is perhaps necessary is for us to establish clearly in our minds who we are talking to when we ask for an increase in production. There is a natural tendency to avoid looking in the mirror when we make our request, and if we are frank with ourselves we must agree that we are thinking more about greater production by direct workers such as miners, steel workers, and loom minders than about the output of managers, clerical staff, and civil servants. In fact, more production by the latter is a possibility not to be treated lightly !

What are the limiting factors standing in the way of increasing production in the near future ? Let us list the more important. They are :—

- (a) The shorter working week.
- (b) The older average age (in 1941, 12 per cent. of people were over retiring age ; in 1971, 21 per cent. will be).
- (c) Raising of the school leaving age (nearly 400,000 fewer young people were available for work this year).
- (d) Higher educational facilities for a greater number and their withdrawal from work during that period.
- (e) The increase in armed forces (see Appendix "B").
- (f) Nationalisation, and Government overheads. Watch the Civil Service grow ! (see Appendix "B").
- (g) The general growth of overheads in industry and commerce.
- (h) The expiration of the American and Canadian loans.
- (i) The lowered productivity of most people.

I think you will agree that this is a formidable list. I will deal more fully with some of the factors as we go along.

WHAT DO WE MEAN BY PRODUCTION? The narrow definition I have mentioned earlier is unfortunately all too common. The wider view is that each of us is a producer, whatever our job, if that job is conducive to broad national progress, and it is only by this interpretation that we shall correct the somewhat distorted picture we have today, where, owing to the narrow definition of producer as direct worker only, we have focused our attention, our efficiency schemes, our speed-up campaigns on a minority of the working population and are taking more and more of the majority to help us do it.

Unfortunately, no Government statistics accurately divide our working population into direct and indirects, but we do find that out of a working population of around 20,000,000, about 7,000,000 are classed officially as in manufacturing industries. Of these, in my estimate, something over half are direct workers in the sense of our common usage of that term.

I want to spend a short time on this matter as I regard the general trend towards higher indirects as one of the gravest factors standing in the way of increased production. I have examined in detail the comparable position not only in our own Company, but in many others at home and abroad; I am convinced that this trend is general, and unless recognised will seriously reduce overall efficiency of working and living. How has this condition developed?

First of all, we started badly compared with our U.S.A. and Canadian friends; overheads were much higher here before the war. During the war the growth of controls, internal and external, was universal; paper work grew rapidly—and you had to engage people to use paper; canteens expanded; personnel departments grew; supervisory staffs were enlarged; consultants sprang up like weeds in summer; public relations departments were formed and, good though *some* of these things were, they expanded more rapidly than the direct producers. Since the war, we have streamlined our direct production activities, but overheads have not been brought down accordingly; neither have overall costs.

Let me say right away that I, as a manager, am more concerned with lowering *overall* cost than with the percentage of direct to indirect. A company may be highly efficient with 1,000 per cent. overheads. Within reasonable limits of time, however, this ratio is important and unless accompanied by a greater percentage reduction in direct labour cost, an increase in overheads is bad management. It is even more serious as it takes away from the direct labour force many who should be engaged in that vital task today.

Let me give you just one actual recent example out of many. Appendix "A" shows three companies situated in U.S.A., Canada.

and Britain respectively. All make comparable products and are within reasonable distance of each other in volume of output. What do we find?

First of all the overheads of the British factory show up pretty badly compared with the others; this is reflected in the selling cost which is the highest of all in this country. Secondly, material costs in the two foreign companies are lower than over here, largely because of lower overheads and greater overall efficiency of their material suppliers. For instance, stainless steel of better quality is available in U.S.A. at about 66 per cent. of the British price. Thirdly, their lower selling costs can be achieved while at the same time paying wages and salaries more than twice as high as our British standards. This is the first thing I wish to stress with you—that if we talk of production we must not stress only the direct workers. We must assume that all are producers and as there are, in total, more indirects than direct in our total working population, the possibilities of increasing the indirect efficiency and making some of them available for direct work is a factor of the highest importance. Many more people are on industrial indirect work today than in 1939—and this takes no account of the Civil Service or other external activities outside industry.

**THE PRESENT SCOPE
OF THE
PRODUCTION ENGINEER**

What interest has the Production Engineer in all this? Generally, I am sorry to say, very little, although it should be something of vital concern to him. Let us turn to the definition of a Production Engineer as stated by his national professional body, The Institution of Production Engineers.

“A production engineer is a staff engineer who normally holds in an engineering works a position of authority involving responsibility for executive management and control for any function pertaining to production. A production engineer is therefore a trained engineer capable of setting in motion, guiding and controlling the many forces required in any engineering works.”

Generally he has lived up to his definition. He has certainly concentrated largely on engineering works; he has concentrated largely on the direct productive activities of the factory and he is in the process of going round in ever-decreasing circles until he winds up chasing split seconds off the rate of an ever smaller number of direct workers.

What about the other activities in the business—those coming under the general umbrella of indirects, whether hourly paid or staff? Generally the term “umbrella” suits them because relatively they lead a sheltered life, free in the main from motion study, piece work, conveyor belts, and being put off in a fuel crisis. They include, of course, the production engineer himself.

What are the professional bodies devoting their time to advancement of techniques among these indirects ; is the same intensive system on control applied to indirects as they are applied to the direct workers ? I doubt it. We generally assume that the individual enterprise, training, and sense of responsibility among indirects provides both goad and carrot.

Professionally there are of course many bodies which cover our indirect interests. There are, for instance, the Institution of Personnel Management, The Incorporated Sales Managers' Association, The Institute of Cost and Works Accountants, and, on the broader managerial side, The Institute of Industrial Administration and The Institute of Works Managers. It is significant that the word " production " is not used by any of them.

**COMPARISON
BETWEEN DIRECTS
AND INDIRECTS**

Let us spend a short time examining the broad differences between direct and indirect workers. First of all the directs.

Generally you will find the direct worker at the lower end of the social scale. It is hardly necessary to remind you that industry in this country has been forced on a somewhat unwilling population, and to be in industry, even in its managerial ranks, has meant all too often in the past that you are not really in the top drawer. This contrasts sharply with America, where industry has achieved a much higher social status, and in the process has attracted to its ranks better people and better performances. The direct worker, that is the worker on machine or bench, on factory floor or underground in the mine, is more often the man or woman who left school as soon as possible and all too infrequently had an opportunity for subsequent education and planned training. Industry has, to many teachers, been a place of employment for the " C's " because no one else will have them.

The direct worker is usually highly unionised, possibly due in the main to the fact that he has from the early days of the Industrial Revolution, been fair game for those who have tried to get greater efficiency of working. His work has been broken down into successively smaller elements, his motions studied with stop-watch and camera down to split second standards, and he has been subjected to a wide variety of incentive schemes in which most of the perspiration produced by the worker has been in his attempts to understand them.

It is to the activities of the direct worker, generally speaking, that the Production Engineer has turned in the execution of his duties and the expansion of his techniques.

Now a few words about the indirects. They are of course also on the factory floor as well as in the offices. They comprise those whose job it is to service and advise, and include the inspectors,

labourers, supervisors, managers, directors, progress clerks, office workers, personnel advisers and so on through the ever growing list. Generally the majority of them are in "office" occupations and as such their status is usually greater in the eyes of their parents and employers than the others. They are more often in the Company's Pension plan, less often put off by a fuel crisis and, because of their relative superiority in conditions and status are naturally having the greater number of recruits added to their ranks today. A recent analysis of several hundred children leaving primary school in a manufacturing area showed that over 60 per cent. of them went into white collar occupations. How do we expect the ever lessening number of direct workers to carry this ever growing burden on their backs and at the same time increase production?

There seems to be no end to the ingenuity of those who wish to find jobs for themselves or others in the indirect sphere. In recent years we have seen the considerable growth of office work and of paper work records. Both in industry and public service the popular conception of management appears to be the creation of idea-tight departments connected by paper bridges. Personnel department functions have tended to grow more quickly than their value, great though that value is in many directions. Consultants are springing up all around and obviously plenty of managers are willing to pay them. Research is a word on all lips but we have not so clearly defined what we mean by it. The easiest thing in the world is to sit and look profound. Incidentally, the amount of research in Production Engineering is still very small in relation to the total. Directly it is only about 2 per cent. of the total spent, taking D.S.I.R. grants as a basis.

The latest effort is in the field of public relations where almost every local council is appointing such an official, quite apart from those activities in ministerial circles. Once again it tends to take away essential manpower from direct productive effort, and, equally important, offends a basic principle of organisation by giving to the staff authority which should be taken by the line.

FUTURE SCOPE OF THE

PRODUCTION ENGINEER

I have shown that so far the activities of the Production Engineer have been confined mainly to the narrow field of Engineering and to one section only—the direct worker activities. Can we envisage an enlargement of his scope, and is he in any case the best person fitted for the job of analysing more fully the activities of the indirects? Certainly we must make such an attempt and it does appear that of all members of the specialist staff the

Production Engineer should be best fitted for the task. Let us look at the training and experience our Production Engineer *should have had* :

- (a) First, a background of shop training and a more intimate knowledge of the mentality and outlook of factory workers. This is a tremendous asset in life if accompanied by other things.
- (b) An analytical approach to the problem of job breakdown, which is a vital preliminary to improved performance.
- (c) An appreciation of the possibilities of the machine and its tools.
- (d) An appreciation of the value of the "time" element as a measure of standards and performance.
- (e) An appreciation of the possibility of motion study as applied to human activities.
- (f) Experience in selection and training as a means of increasing production. These activities are more generally applied to direct worker activities than elsewhere.

Here then is a first-class foundation on which to build a more ambitious edifice than has previously been attempted. Let us see what possibilities exist for the Production Engineer over the next few years.

THE DIRECTS "Never were so many relying on so few" may well be the motto today and tomorrow! The Production Engineer must continue his already sterling work among the direct activities in order to raise P.M.Y. The average American worker does produce considerably more than his counterpart here, not so much perhaps by harder physical work or longer hours, but by having more power to his elbow. He has at least twice the horse-power per person available to help him in his task, and this is made available by better lighting, heating and ventilation, better lifting equipment, and generally many more mechanised "gadgets." Don't be misled by the apparent large size of American firms and their home market. In 1939 over 95 per cent. of American firms employed under 100 people, compared with 77 per cent. here at the last census. The basic production machines here are often American made and in actual use can probably turn out as much as over there. They are however likely to be broken down and changed over to new styles, new components more often in our factories—in other words their overall efficiency is lower. *Appendix "C"* illustrates what happens to many components in their progress through the factory. Realise that the actual time spent on processing is small in relation to the overall time spent on the floor and in the stores.

Even in America they have great room for improvement in a

wide field, notwithstanding the comparable figures shown at the bottom of Appendix "A." For instance, about three-fourths of the nation's wool is produced in the 12 Western States, including Texas. Still "in the grease," almost all of it is loaded into freight cars and shipped bodily across the country to the Boston region—up to 60 per cent. of the weight thus transported is grease and dirt. Cloth and garments made from the wool are then shipped back 1,000 to 2,000 miles. Just a job of production engineering to do in a wider sphere.

Our Production Engineer still has plenty of scope for improvements on the factory floor, particularly if he will concentrate more on better layout organisation, better flow of work, reduction in the volume of work-in-process and—here is a great opportunity—extend his activities beyond engineering and realise the great opportunities existing on the factory floors of other industries where there is much evidence that the direct production people still embrace the creed of the Primitive Methodist!

The building industry represents another glaring example. Its efficiency compared with pre-war is terribly low and it's not due only to men leaning on shovels. Another industry of great future significance is Agriculture. We are going to be vitally interested in home food production and opportunities abound for the application of production engineering principles to farming.

You have all no doubt read the reports of the various Working Parties. In several, attention has been drawn to the great need for better productive methods. Cotton, Hosiery, Pottery, all need such men to do for them what has become commonplace in many engineering factories. I have recently been asked by executives in at least two such industries to recommend top grade production engineers at high salaries for the job of introducing new production techniques. It has been difficult for me to find such men who can combine production engineering experience with a managerial flair.

Reference back to Appendix "B" will give you an approximate idea of the number of people employed in various activities throughout this country. You will see that on this basis great opportunities exist for improving the efficiency of manpower outside the direct engineering industry.

THE INDIRECTS I have already mentioned those qualities that should be possessed by our good Production Engineer. It is in the field of indirect activities that I believe his great future lies and in which he can show economies of labour which will, because of the greater number involved, be more spectacular than anything he has achieved so far. No other specialist can come near him in having such a background of

technical experience at his command. There is one thing only that is likely to prevent him—what is it? I think it is as well to look for a few minutes at the policy and performance of the national body representing the Production Engineer in order to find a clue.

What is the policy of the I.P.E.? Its history is probably well known to many of you but for the benefit of the uninitiated, it was founded 26 years ago by a small band of engineers, most of whom were members of other institutions, largely because these institutions would not devote enough attention to this new technique of production engineering.

Its progress has been steady, but in my view not what it should have been because of a somewhat restricted outlook on the part of many of its members. Let me say right away that as a member of Council for many years I accept my full share of blame for any failure to achieve higher status.

What has been the limiting factor in its progress? Largely, I believe, because the Institution has failed adequately to link itself to *Management*. Very rightly the technical problems of production have been given special attention and no body is more appropriate than the I.P.E. to investigate and study such matters as jig and tool design, machine utilisation, metrology, surface finish, and flow lines.

But are these all the problems of Production? The study of Production Control was a wartime development of the Institution but was undertaken in rather a half-hearted manner. Time and Motion Study has not been given the special study it deserves, and it was this inattention that was largely responsible for the formation of other bodies devoted to such activities. It was noticeable at various gatherings of production engineers that problems of factory organisation were discussed on an informal basis more than cutting tools, and one had the feeling that members had a real interest in such matters as shop stewards, joint consultation and other such managerial matters. When, however, it came down to formal discussions at section meetings, or expressions of Council policy, a note of caution dominated individual interests, and anything which could be regarded as controversial or outside the sphere of technical discussion was frowned upon.

The late Richard Hazleton, whom it was my privilege to know well, was largely responsible as its General Secretary for taking the Institution even as far as it went in the direction of a wider outlook. He recognised that the Production Engineer could develop easily into the Production Manager, the Works Manager, and the Managing Director. He saw that the raw material was particularly suitable for moulding into other shapes and that it

was vitally necessary to provide an institutional link by which the Production Engineer as a technician could be encouraged to build himself into the Manager.

Hazleton's dream has not yet come true, and the relative failure of the I.P.E. to link itself effectively with Management has prevented it on many occasions from being consulted on major policies. Many will know of the hard struggle to win acceptance by the Board of Education of a Higher National Certificate in Production Engineering. Some will know of the manner in which the Institution has been left out of consultation on many important matters over the years. It is a real credit to its members that it has accomplished so much in so few years, but it could have accomplished more by giving itself a broader base on which to build.

TODAY'S POSITION Is there any improvement noticeable 'today'? Yes, there are signs, although there is much more to be done. If we take the subjects discussed at section meetings as a guide, we find that out of a total of 180 papers presented at all sections during this past session, only 12 were devoted to what one could call management subjects. Not an appropriate percentage, is it? Of these few, London had a higher percentage than all others which is of course merely another way of saying how wise you are.

One of the most significant steps taken by the Institution of Production Engineers was the setting up of a Graduateship examination some years ago. This was the first step towards a broader basis of qualification for membership and encouraged prospective graduates to engage in a more detailed and yet wider study of industrial problems as a supplement to their normal practical experience.

Unfortunately the tendency of Council, during earlier years, was to waive the examination in a large majority of applications, usually on the basis that the candidate was too busy to study. Even last year, out of a total of 110 Graduates admitted to the Institution, only 22 passed the qualifying examination, although a relatively large number in addition were admitted through having passed an equivalent examination, which is not really so good. I am not one who believes in the exclusive value of such tests, but they do encourage systematic study; they do require the student to study organisational and elementary managerial subjects in addition to functional ones, and they do encourage the competitive spirit which is so lacking today. As important as any other value, they impress upon the lay public a feeling that greater status can be attached to the title which has been gained by such effort—you are all aware that a thing that has been worked for is treasured more highly by the recipient and the public. On this basis I am positive that further examination facilities must be provided by the I.P.E. in the coming years so that applicants for higher membership

can be examined. These examinations will no doubt be designed to encourage wider managerial experience and obviously will not be entirely written, as the Production Engineer must encourage himself to express his knowledge in other ways also. Perhaps of all engineers he is the one who should be the most articulate. It is essential to have goods in the shop, but a show window is also valuable.

I am sorry to say that I have failed to find among Production Engineers generally a real interest in management subjects and yet, as I have stated earlier, I believe his background, training and possibilities are better suited than almost any other functional executive for the wider responsibilities of management.

**HOW CAN
THE GAP BE
NARROWED?**

First, let us examine the position of the Institution of Production Engineers in relation to other Institutions, and to its own possibilities. We find, for instance, the following membership figures of similar functional bodies :—

The Institution of Electrical Engineers ...	30,000 approx.
The Institution of Mechanical Engineers ...	24,000 "
The Institution of Civil Engineers ...	16,000 "
Institute of Cost and Works Accountants ...	6,500 "
Institute of Personnel Management ...	3,000 "
British Medical Association ...	56,000 "
Institution of Production Engineers ...	6,900 "

What is the possible size of the Institution of Production Engineers without watering its membership too much? Let us assume that the better type of foreman or his equivalent is eligible, plus of course all higher production executives up to and including Directors. Is it too much to ask therefore that there should be at least one Production Engineer in every firm within British Industry? At the last census there were 53,000 separate firms. There are 6,900 members of the I.P.E.

The first step therefore seems to be to attract a greater cross-section of industry's productive talent to the ranks of the national professional body. That in itself will ensure a more solid basis than exists today, where far more productive people are outside rather than inside the body which has the main responsibility for increasing the knowledge and status of the Production Engineer. As an example of drive and enthusiasm devoted to individual and Institutional progress, I would commend to your attention the Institute of Personnel Management, which has literally lifted itself up by the shoe laces in increasing its membership from about 1,000 to 3,000 in six years. Most of their meetings tell you why.

Secondly, we shall narrow the gap by giving our production engineers more opportunity for training in supervisory and managerial subjects. There is a tendency today for people to stick

too close to the grindstone and I believe we are getting short-sighted. There is no inspiration so positive as the job of watching and beating the other fellow's performance, and the more you let your potential managers study other performances, the more likely they are to have a go at something better. One of the greatest assets of the American productive industry in pre-war days was to open its doors, its files, its techniques to others—even its competitors—and we had much to learn from that example, which brought with it a higher standard of productivity than we have ever achieved.

Don't forget that foreign travel is well worth while. My own Company had outstanding results last year from the visit of a team of engineers and accountants to U.S.A. and Canada. The practical results of measuring their performances against ours have been most valuable, and the wider outlook of those taking part has been another great gain. One useful idea pays for the trip.

Thirdly, production engineers should be encouraged to participate more in supervisory discussion group meetings inside and outside the firm. I think every firm of every size should give training in managerial subjects to its promising people, and after considerable experience I must say that production engineers do not seem to take much interest in widening their experience this way. They often fail to see the wider vision.

Fourthly, we must endeavour, by long-term activities, to get better raw material into industry. This opens up a big subject, but a vital one. It is well-known that industry in this country has not yet achieved a social status corresponding even to commerce. Teachers, parents, educational authorities, generally regard industry (particularly its so-called manual side) as a suitable recipient for the lower grades and, as I have previously said, even the industrial supervisor or manager is not really quite in the top drawer. These are strong words, but too true, and the situation here differs in marked degree from the American scene, where industry achieved many years ago a status higher than most other activities. The result was that better people were attracted to its ranks, its technicians were of a higher standard, and were better equipped to expand into managers. From this sprang the higher standards of performance, and naturally higher standards of financial satisfaction, and finally a higher material standard of life for most people, because industry was recognised more fully as what it really is—the most significant means of creating wealth in the world.

Yet another step we can take to narrow the gap is to give greater promotion opportunities to those employed on the production side of the business. In the past all too few directors were found who had previous experience in the practical sphere of factory activities.

Today more boards have on them men who have won their way through this side of the business, and every such person is an example to others who aspire to further heights. With production as the keynote of business over the next decade, the Production Engineer has many opportunities for increasing his status, and fortunately there are many in established positions willing to give him his chance, if he will take it.

Let him have no delusions on this question of promotion—there are many candidates. Never has the producer had surrounding him so many advisers and assistants. Reference to the analysis circulated will show that the direct workers are very much in the minority, and the growth of indirects has meant not only a growth in their numbers, but in power also. With the continued growth of large-scale units, whether Government or private, power is being collected into the centre, and in this small exclusive circle the indirect adviser, whether personnel officer or public relations officer, is more likely to be heard than the actual producer in the factory. The latter individual is however in the key position, and must only blame himself if he does not make his voice heard more effectively.

Lastly, the gap may be narrowed by closer liaison, individually and collectively, between the Institution of Production Engineers and such national management institutes as the Institute of Industrial Administration. I firmly hold the view that, in general, a man should qualify at least as an Associate Member of his particular functional or technical institution, like the I.P.E., before attempting to get admitted to a general management institution. He should have a good technical foundation.

What interest has the corporate production engineer in general management? Last year, out of 580 new members of the I.I.A. only 20 were members of the I.P.E. There were many accountants, personnel officers, salesmen, purchasing agents, but so few production engineers. Was this because of their lack of interest in management, or in the I.I.A. in particular? Largely, I believe, because of lack of interest and of wider vision.

I received statistics a few weeks ago from the principals of two of our larger London technical colleges who run large managerial courses. In one there are 302 part-time managerial students, mostly over the age of 21 and engaged in many occupations.

About one-third are engaged in engineering production, almost another third on production in other industries, and here is a fact which astounded the Principal if not the author of this paper, only 2 out of the 302 are members of the I.P.E.

In the other case, out of about 150 management students about half are in engineering productive departments, a further quarter in other productive industry, and only 5 per cent. of the total are

members of the I.P.E. In yet another case, in a large Birmingham college, out of hundreds of management students, only 3 per cent. are members of the I.P.E.

These figures certainly bear out my previous contention that very few managerial aspirants seem to come from the I.P.E. They certainly show that the I.P.E. does not yet represent anything like a reasonable percentage of those engaged in overall production.

If we consider the question of joint Institutional activities, we do find some sections where such activities take place but, as I have mentioned earlier, discussions on management subjects, either within the I.P.E. or jointly with management institutions, are far too rare. I think the principal responsibility rests on the *functional* institution, which is really the one to broaden its base. In the syllabus of every I.P.E. section I believe there should be at least two joint meetings per session—one with another functional institute and one with a management body. It should be a directive from the Council.

From the foregoing I hope I have given you the impression that the future of Production Engineering lies with the production engineer himself. He has reached, through trial and tribulation, a certain stage in his development where he is recognised as one having a valuable part to play in industrial progress. I believe that he is as yet only on the lower steps of his ladder of progress and that the future holds far more than he himself has yet visualised.

I am reminded here of some recent words by Sir Richard Livingstone dealing with the dangers of Specialism. He said this: "The scientist, it has been said, explains everything but himself. Nor is he concerned with human values. The words good and evil do not naturally come into his vocabulary. To deal exclusively with atoms, elements and cells is a bad preparation for dealing with or understanding human beings or human problems; indeed, it is no preparation at all. This is the more serious because the influence of science and the need for scientists will increase. It is significant that the numbers offering science as their main subject in the higher school certificate examination increased from 44 per cent. in 1939 to 53 per cent. in 1946; it is melancholy to reflect how narrow the education of most of that number was. The balance may well continue to swing in the direction of science. . . . The true remedy is to see that the education of scientists includes the training in the humanities, which will enable them to play their full part in national life, not merely as superior technicians or expert specialists, but as citizens and directors of policy."

The production engineer needs more than ever an appreciation of what is called the humanities. He, more than any other

technician, must consider not only the technique of planning but of execution also. His work is of no value unless it is accepted by and operated by men. The art and science of persuading men to work better is another name for management and so in the last analysis production engineer and management techniques are so complementary that they cannot be separated.

If the production engineer is to rise to greater heights he must close the gap which at present exists between his outlook as a production engineer and his outlook as a manager. Only by taking a wider view of his activities, his sphere of influence, his value to industry, can he hope to take his potential place in the industrial community.

In view of the supreme importance of such attainment, I hope he will be equal to the challenge.

DISCUSSION

The Chairman said he thought everybody would agree that Mr. Puckey had presented in a most able manner a very clear picture of an angle of production and management technique which was entirely distinct from pure production processes. He had raised a number of quite controversial issues and had been very pertinent in certain directions, which would undoubtedly provoke a good debate.

Before the general discussion was opened, however, the Chairman would call on Mr. Stuchbery to speak.

Mr. Stuchbery said that Mr. Puckey had impressed him particularly by the care he had given to a self-examination of the functions for which the Institution stood, and the opportunities he had offered them to look at some of those things which they frequently ignored—perhaps because they had other things to do, perhaps because they had not the courage to look at them. He felt pretty certain that what Mr. Puckey had said was in a very large measure what they had all thought for a very long time, and continued to believe. He would not say that covered the whole of Mr. Puckey's address, because a good deal of what he had said was controversial. At the same time it was true that in this question of the load which was being carried by direct workers, production engineers as a whole were very conscious of the situation and would be only too glad to find some means of dealing with it.

He had often wondered, particularly recently, to what extent production engineers faced the fact that control for its own sake is becoming the excuse for control. It is an extension of power that Lord Acton said demoralised—and absolute power demoralised completely. So it seemed with a great deal of their organisation; control was sometimes increased purely for the sake of increasing

control, and the more control there was and the higher one went up the tree, the less knowledge one found and the more difficult it became to acquire.

The suggestion that the "indirects" should be examined was a very profitable one. The man who looked at all the forms he used during a year and took stock to see how many of them still provided him with a useful answer was a very wise man. If everybody did that, there would be fewer hours wasted in filling in pieces of paper merely destined to take up space in the files.

There was one question, Mr. Stuchbery said, which he would like to ask Mr. Puckey in regard to overheads. It concerned the relationship of indirect cost in this country and in the United States. He himself had formed the opinion that apart from the indications given by Mr. Puckey, a considerable difference arose from the fact that the Americans recovered their indirect expense in many cases over a longer number of hours in the week. He thought shift work was much more extensive in the States, and that if they were obliged to cut down the working week, not in terms of per man but in terms of shorter working weeks in equipment, they would find a considerable increase in overhead costs. He would like to have Mr. Puckey's opinion on that point in due course.

Everybody must have been impressed, continued Mr. Stuchbery, with the statement that among school leavers 60 per cent. were going into white-collar occupations. It was probably true to say that the Americans had a higher status for industry than existed in this country, but it ought not to be true. The pioneering done in industry by this country should enable it to paint a picture of the actual dignity of labour, the sheer citizenship responsibility of industry, if the best was to be got out of it. Production engineers might well consider to what extent they are responsible outside the works entirely, outside the question of direct costs or indirect costs, for propagating the principles of true citizenship and the need for education along these lines.

With regard to the question of the production engineer himself, he said, he had never taken the narrow view that a production engineer was a man limited to production engineering, but rather that he was a man who applied the principles of engineering to producing; what he produced did not seem to make much difference so long as it was fruitful in man's civilised life. If a man was applying the arts of engineering to production, he was a production engineer.

Although he made no apology for the Institution, Mr. Stuchbery said, it was well worth while to look at it critically, to appreciate fully what it stood for and what it had done. It was only about 25 years old, but industry was not very old either, and it must be remembered that the Institution of Production Engineers came into being while many of the pioneers in some of the arts of management

—whose names were familiar to everybody present—were still alive. In those 25 years, it must be recognised, something had been done towards the art of production which just could not be evaluated. Those present were all very familiar with what had happened during the war, with what had been achieved by engineering production ; there was no need for him to emphasise that. It should also be remembered that the Institution had done something in regard to research. If, judged on the basis of the D.S.I.R. grants, research in engineering production was but 2 per cent. of the total, then it would be fair to assume that this 2 per cent. represented what was started by the Institution.

Recalling to mind some figures he had seen some time ago, Mr. Stuchbery said, with regard to the growth of the Institution, that in 1939 there were about 500 members in the London area, while now there were nearly 1,700. That was a very creditable performance, but it was not good enough. The Institution was certainly not bringing into its counsels the people who could help in the higher ranks of management ; but on the other hand production engineers had branched out into the sphere of management.

Finally, he said, it would seem that when the production engineer did get into the higher flights of management he had the responsibility of seeing that his principles were applied in cutting down waste wherever it was to be found, particularly waste in the "indirects", as Mr. Puckey had said, and in administration generally. He (Mr. Stuchbery) was perfectly sure that the engineer was traditionally inarticulate ; he should get out of that habit as soon as he could. Above all, to add to the last note sounded by Mr. Puckey, he must have absolute integrity. He would then be able to approach and deal with this so-called clash of interest which had been built up by tradition, between the workers and the rest. It ought not to be there, and it was their job—the job of those who had been in touch with the workers—to deal with it. They knew how the workers felt ; they knew that with the monotony of their jobs they were entitled to know what it was all about. It was the business of the production engineers to see that they did know.

In conclusion, said Mr. Stuchbery, he would like to thank the Chairman for giving him the opportunity of speaking.

Mr. Puckey, replying to Mr. Stuchbery's point that production engineers would be glad to find some way of dealing with the problem of indirects, said they did not have to have the answers handed up to them on a plate. They had the responsibility, and if they felt the job was there to be done they should go ahead and do it.

The whole essence of his argument was that the production engineer had the training and background to do it, and all he needed was determination. Up to the present he had not been willing to go forward and do this work. Longer hours were an

important consideration, particularly in regard to the recovery of overheads. Naturally if a machine could be used for a hundred as against forty-four hours a week and other costs did not go up too much—supervision and things of that nature, for instance—economics would quite obviously be effected and overheads would go down accordingly. But too much notice should not be taken of that particular red—or slightly pink—herring, and it really should not be brought in at all as an important factor in the argument. In this country there was not the flexibility on the part of labour generally that certainly existed in America, where there was greater readiness to work different hours and shift from one job to another, and to work on what was called during the war the night, or graveyard, shift. In this country there had been a tendency to greater rigidity in various directions, but relatively speaking, though this did play a certain part, it was not the most significant part of the overhead comparison.

Mr. Stuchbery had touched on the most important point of the status of industry. Perhaps those who had been brought up in industry did not always see the wood for the trees. He (Mr. Puckey) thought a very great deal of the lack of status of industry as a whole had been due to the inability in this country to put industry in its right perspective. School teachers, for instance, regarded it if not with suspicion at least with some measure of contempt. Production engineers themselves must go after the teaching bodies. Teaching was quite an important profession, because in their formative years students were influenced to a very great extent by their teachers and, of course, by their parents. Production engineers themselves did not “sell” industry. It needed selling, as indeed did everything else.

What he would like was to feel that instead of almost queueing up to go into commerce and other white collar occupations, people would queue up to go into the factories and even into the coalmines. They must have the advantages and facilities offered put in front of them. Industry had done a tremendous lot in helping to build up a social conscience in this country, but there was not sufficient realisation of what it had to offer those who went to work in it. Their job as production engineers was to show people what industry meant and what opportunities existed in industry. So far production engineers, and particularly managerial staff, had not taken full advantage of that job.

In his references to members' appreciation of the functions of management and the necessity for studying management, Mr. Stuchbery had perhaps given too much credit to the Institution. While he (Mr. Puckey) did not want to take any credit away from it—he had been a member, and an active member, for a very long time and realised how much had been done during the past twenty-

five years in building up production technique—he was not talking so much about the past. The past should be used merely as a stepping-stone or guide to the future. He was reminded here of something he had once heard said : that Hitler stood for everything the Germans fell for. One could almost say the Institution stood for everything its members fell for. It must stand for something a little different in the future—and he thought the members would fall for that, too.

As far as the future of the production engineer and his work were concerned, he said, he appreciated the necessity for building up production techniques in the narrow technical sense ; there was so much to be done in that direction. But he was convinced, the more he went through life, that better standards nearly always sprang from the inspiration of managers. The production engineer in himself, by himself, was not necessarily inspired. He was, one might say, a journeyman doing a particular job. The function of management—and management covered a very wide sphere and not merely the top people—was to inspire other people, to inspire the men to do something better, whether it was a better performance, a better jig and tool machine layout, a better factory, or whatever it might be. That, generally speaking, was the function of management. It needed a wider vision and the future of the production engineer lay far more in the future of management than with the production engineer himself. That, said Mr. Puckey, was the essential part of his argument. Many of those in front of him and many members of the Institution—he happened to be one of them himself—had grown up in production engineering and had grown into management. That was fine—let there be more of them. The possibilities existing among the 6,900 and potentially, the number of members of the Institution of Production Engineers to go into management were far greater than anything that had existed so far.

The Chairman said the meeting was now open for general discussion.

Mr. Wilson said he wanted to challenge some of the speaker's statements as to direct and indirect labour. Mr. Puckey was, he thought, taking a cross-section of the whole engineering industry. But in light industry indirect labour was definitely overcrowded, while on the heavy engineering side it was quite the reverse. Having had a little experience on both sides, he could say the heavy engineering industry was more crowded on the side of direct labour. In one case in point, for every half-ton of work turned out there were two-and-a-half tons of paper work.

Mr. Puckey said he could not accept the challenge, because that was precisely what he had said himself. Both he and Mr. Wilson were betting on the same horse as far as he could see, and it was simply a matter of emphasis.

In his own paper he had said that indirects represented something over half the people in manufacturing industry. If he was asked to define more precisely what "something over half" meant, he would agree broadly, on the basis of his own experience, that light industry seemed to be overcrowded in relation to heavy industry, though he could point to cases where the reverse was true. Broadly that was the tendency, however, and so he did not accept the challenge. Perhaps it was a pity they did agree, but they were talking in terms of degree, not in terms of principles. The principle involved was not at issue.

It must also be remembered that in talking about manufacturing industry he had not himself coined that particular word. It happened to be one of the statistical terms used by the Minister of Labour and in every census that was taken, every figure that was put out, there was disagreement. There seemed to be the most profound ability in publications to disagree with one another on every statistical figure. Nevertheless, the fact remained that taking a cross-section one did find that manufacturing industry represented about seven million people. It had to be remembered that, talking about it in the broadest possible way (though that was perhaps not fair) there were forty-seven million people in the country and indirects therefore, in that sense, could pile up to a greater degree than something over half, taking, if they wished, the working population as about twenty million people.

The large majority of civil servants, as distinct from those engaged in, say, ordnance factories, could be classified as overheads. They had to be provided for; there had to be production for them; they had to earn their living and eat and drink and use the things the manufacturing and other industries provide. Taking a broad view, it would be found that the direct workers were *very* much less than half. In heavy industry there was a tendency for the numbers to be less and in the light more, but that did not alter the principle of the argument, and the problem still remained to be dealt with.

Mr. Burnett said he did not think anyone would quarrel with Mr. Puckey's general principles. When it came to a question of education, again, everyone would agree. But it did strike him that probably education should start at a different level. The younger members of the Institution, he felt sure, would like the opportunity of expressing their training and ability in terms of management. That education should come from the top level, from top management, which should give the production engineer his opportunity, knowing his value in the production field in the widest sense. Had Mr. Puckey any figures with regard to the number of students that had been drawn from the engineering field to attend the Administrative Staff College, Henley?

A second point: Mr. Puckey's paper had referred to diametrically

opposed subjects—the widening of the membership of the Institution and the raising of the standard required to attain membership. These conditions could not both be applied, of course, until there had been a very long-term effort to train the younger engineers to attain the required standard, and that field should be very carefully explored by the Institution. Obviously it was desirable to widen the membership, but great care should be taken not to lower the standard.

Mr. Puckey said he was glad to hear that Mr. Burnett who, he thought, also spoke for others, did not quarrel with the principles underlying his paper. In the past, it seemed to him, the main problem had been one of principle. Once the principle was settled, there would seem to be great hope of going forward on a satisfactory basis. The Foreign Ministers gathered together at the present time certainly did not agree on principle, and consequently they would certainly never agree in practice. That was an ideal example where principle had not been fully accepted. It reminded him of a story he heard in Sweden about the wife of a worker in a steel mill. He unfortunately had an accident and was killed at work. Representatives of the company came round to break the news to his wife and to offer their condolences to her. She was naturally very shocked by this and after she had recovered a little, she sobbingly said how good a man he had been. "For twenty-four years he had worked in that particular steel mill and had come home every Friday morning and put his pay packet on the table. Of course, very often there wasn't anything in it, but it was the principle of the thing that mattered!"

It seemed to him that there was agreement on principles and he was very much relieved. The details did not matter very much after that.

With regard to the suggestion that the education of the younger people was a prime responsibility of those in top management, Mr. Puckey went on, he might call himself, as an individual, in or near top management and must accept all his own responsibilities. He did not want to dodge any of them, and he was sure other people in top management would not want to do so either. But the fact remained that it reminded him of a spring. Did a spring bubble out of the ground by being drawn up by the sun or by being pushed up from down below? Perhaps it was a bit of each. Looking back at his own career, such as it was, he seemed to see he had had to do a good bit of pushing himself, one time and another. He thought there was a tendency nowadays for people to sit down and wait for opportunities rather than make their own. He would strongly commend—to younger people particularly—the fact that there were a lot of openings to-day, but very few people who were

ready to force their way through them. He would stress that fact to those people who felt that top management was very unresponsive and had no imagination at all.

He would let them into a secret, but they must not tell anybody about it. Very often members of top management were deliberately obstructive or obtuse. They would not see a thing and they did it quite deliberately, because it made the "bloke" down below fight harder. Of course, they must not imagine, when they saw a look of pained surprise come over the face of a top manager, that he was deliberately being obtuse; it might be that he just did not understand. But he *would* suggest that they, the juniors themselves, should do at least 50 per cent. or rather more than 50 per cent. of the pushing. Those up above would be found to be quite willing to make way.

As far as the number of production engineers in management training were concerned, he had given the figures and he did not quite understand the question put to him on that subject. The figures he had mentioned illustrated how few members of the Institution of Production Engineers appeared to have any interest, at least from the point of view of carrying on further studies of management in technical colleges. They were fantastically small in relation to the possibilities which existed. The facilities were waiting for anyone who took advantage of them. But the number of people, as he had already said, on the direct producing side, who took an interest in them seemed to be lamentably small. As far as long-term training for management was concerned—and naturally management was a long-term training job—this subject could be studied just as any other job. It was rather more intangible in some ways. You could not, perhaps, lay down all the principles quite so clearly. You had not got measuring sticks, micrometers, gauges, and so on. Nevertheless there were a good many things that could be studied and a good many ways of applying the principles, too. The whole gist of the argument came down to this: did you feel that you had the possibilities for wider opportunities? Did you feel that you were willing to study management? If so, as a production engineer you had, perhaps, by your background, a greater opportunity to get ahead into management and to understand management and to practice management than almost any other technician. So it was really up to the Production Engineer. They had practically all the advantages—the trouble was that so far they had not seen them.

Mr. Wilson asked whether the lecturer would say the Americans spent more money on the development of new ideas than the British people. Most firms—Mr. Puckey's own factory, for instance—had a box so that anyone could place his ideas in it. But were funds allocated for the development of ideas, irrespective of those sugges-

tions put into the box by the workers themselves? To give an example, a famous canning company produced three-quarters of a million cans a day from plucked sheet which had come from all-American manufactured machine tools. No doubt people in this country knew about that, but they seemed to use all the top production machinery from the States and did not spend as much money on development as did the Americans.

Mr. Puckey suggested that that question would seem to lead to a particular technical field in which there might be difficulties. But he had just heard the Chairman whisper that this country was better than America in the matter raised. He himself was not sufficiently well acquainted with the manufacturing processes of the company concerned to argue the case, but broadly speaking he thought the Americans did spend more on development. That was his own experience and it was based on a range of industries. What he had had in mind was not what had been referred to as the "box" idea, which was presumably the ordinary suggestion box.

Undoubtedly the rewards for ideas were very much greater on the other side. He had recently analysed the ordinary suggestion box idea rewards covering a number of companies, including that of his own firm, and had found the average standard of suggestion reward to workpeople was approximately eleven times greater in America. It was difficult to say precisely whether the average standard of ideas was eleven times as good, but the financial rewards were very much greater.

On the development side he would say more attention was devoted to research in America, for example, in the technical journals. Americans were, of course, good at selling; they were past masters in the art of putting a thing in a shop window. Let it be admitted that that was part of their make-up. They forced a thing on people's attention more than was done over here. Anybody who read a wide range of American technical journals, as Mr. Puckey did himself (though he could not say he read them from cover to cover) would know that they were more thorough in many ways.

A shop steward had recently been sent over to America for six months to study certain production techniques. He happened to be a production engineer also—an odd combination, but there it was. When he came back he said that two things had struck him particularly about American industry, and he had had a very real opportunity of examining it in various ways.

First of all, he found Americans very much more thorough in getting down to a problem. If they wanted to solve a problem—design production, or any other technical point—they seemed to harness their facilities to that end much more than was done over

here, and in the end the results seemed to be very much better, generally speaking. Over here, people seemed to play about with the problem far more than over there.

Mr. Puckey's own personal experience was similar. Take, for example, the writing of a report on a particular project. The average American report on a particular project was generally a much more thorough job than a similar report on a comparable basis over here. He was not talking purely of reports by production engineers, but the tendency over here was for a report by, say, a supervisor, a foreman or someone like that to be limited to a particular aspect. In America they did not act in that way, and he would like to employ a few of them over here. The tendency here was to say: "Of course, this is my sphere and I will confine myself to it. I will just turn in something and the fellow above will have to find the remaining information somewhere else. I will merely refer to it."

Over there they would take great trouble to find out from other departments other aspects of the project and to make a far more complete report. As our young engineer found, they did seem to be more painstaking generally, and their thoroughness was combined with willingness to spend more money or more time on a thing. This, he thought, had a great deal to do with the better results they achieved.

Mr. Wilson said he had not intended to create a technical discussion. What he was asking was whether in the speaker's experience Americans spent more money on development work and whether in his opinion this was an incentive to the production engineer to produce a better job.

Mr. Puckey suggested that that was perhaps another way of putting the question and another invitation to him to say the same thing over again.

It was regrettable, from the point of view of the audience, perhaps, but that brought out another angle which was pertinent there. He referred to the paper on Capital Investment which the Government had just brought out. He did not know how many of those present had read it, but if they had not, he would lend them a copy.

He did not want them to think he was trying to argue that everything was all right in America and all wrong here. He was merely trying to draw first his own, and afterwards other people's, attention to certain matters in which others had gone further along the road, maybe, than was the case in this country as yet. In America—in fact, in the New World, the United States and Canada, bringing in the British Commonwealth to make the weight—there appeared to be a greater willingness among people in the past to be pioneers.

Everybody knew of the young fellow who served coca colas,

ice-cream sundaes and so on to pay his way through college. People were more flexible in the sort of job they were willing to tackle. Here they all knew the jokes about the plasterer who would not take up a hammer and the millwright who would not handle a pane of glass. They had all found examples in their own factories from time to time. There was a greater rigidity in most people, including managements, than in the New World.

A good deal of that rigidity had been avoided in U.S.A. by constant development. They had had expanding frontiers—a considerable advantage to them. They had had an expanding economy, so that they had brought in new things to meet new needs—new methods, new factories, new conditions. The result was that people had not become set in their ways. The influx of labour from Europe and elsewhere meant that people moved from one job to another and at no time settled in a groove. That encouraged a willingness to acquire new techniques, to handle new things without arguing too much about whether the job could be done because the unions did not like it, or something of that kind. Over here the tendency had been very much the other way. In the years prior to the war there was a restricted outlook, a tendency to live on one's fat, so to speak.

It was the exception rather than the rule to find factories where there was a constant renovation of machines and a certain amount spent every year on finding better methods and machines for doing the job. Consequently the factory was all too often at the stage of having to do something drastic with the knowledge that the techniques were bad ; that a revolution was needed, and when it reached that stage, a revolution of ideas was too much for the people who had to run the factory and the machines. Therefore difficulties developed and all too often it proved impossible to get new ways of thinking and new ways of acting accepted.

Flexibility of mind was one of the most important things. In the end ideas had to be operated by the men in the shop and were no good unless they could be so operated. One of the main points managers had to bear in mind was that they must have a constant policy of change. If he himself went into a factory and saw a mess in a certain department, the reason for which was that the manager was changing the layout, that would be fine. That was the sort of thing he liked. He liked to feel that yesterday was one thing and to-day something else, provided it could be proved to be something better. That was the way to improve flexibility of mind and spirit—to have a constant basis of change ; to be willing to spend more money on new ideas ; to be willing to put new ideas into operation on the floor of the factory.

Mr. Star said that as one of those flexible people from Canada, he would like to jump into the discussion and trail his coat before Mr. Puckey and the members of the Institution in general.

He wanted to emphasise something that he thought Mr. Puckey had been saying—namely, that the indirects should not be condemned out of hand. One did not say indirects were too high, just like that. One said: "Apply the production engineer's approach. Apply analytical reasoning to the problem of the indirects. See if they are high enough, if they are too high. Measure them against a standard."

It was so easy for someone from the heavy engineering industry, for instance, or possibly from a light industry where they had very little paper work, very little in the way of inspection, very little in the way of other indirects, to go into one of the more complex light engineering firms and proceed to condemn all indirects, the paper work in particular, because they did not think it useful. The problems were entirely different. The complexity of the light engineering job and possibly the quantities and number of operations carried out made the paper work problem essentially more difficult, to start with. Brains were needed—production engineers' brains—to solve these problems and get the paper work right.

There was a tendency on the part of laymen in general and in the Press to say: "Well, these things are above our heads. It is very difficult to follow this stuff through. It is an awful tangle, and it would be much nicer if we did not have it. That was not the way we were brought up. We just leave it to the foreman." They must not run away with the idea that Mr. Puckey or anyone else had told them that indirects were bad things. The indirects, the overheads, were very often a measure of the brains in the organisation. If he might just illustrate that briefly, it was nice to think how cheaply a project could be carried out if you proceeded to sack all your research department, all your inspectors. You could undercut competition straight away. The answer to that was that you would get along for a few months, perhaps longer. By that time, the competitor down the street would have some new projects that you had not considered. His quality would be good. Your quality would be getting a bad name with the customer because the inspector did not see the poor quality. So it was the unit cost analysis—the production engineering approach—that mattered.

Mr. Reynolds hoped he would be excused, as a visitor who was neither a production engineer nor a manager, from butting in. Mr. Puckey had emphasised the necessity to sell industry to people and the necessity to enlarge the society so that they could sell it. Might he ask Mr. Puckey why it was necessary to sell industry and

why the Institution of Production Engineers were the people to do it? He felt they were trying to tackle certain problems without quite realising what caused those problems.

To give an example, his own firm had spent a great deal of time on late timekeeping, and they had gone to great lengths to devise ingenious methods of ensuring that people got to work on time. There were lots of clocks which had to be punched; pay was docked.

On investigation it appeared that they were trying to stop 8 per cent. of the people working in that firm from being late, and were penalising 2 per cent. who failed. It was nothing but a nuisance. He suggested that they were working on the wrong lines in so far as they did not realise why people were late. His own view was that everyone, whether he was a managing director or merely pushed a wheelbarrow from one place to another, did desire to work, and rather than worry about methods of selling industry, one should find out why it was necessary to do so.

Mr. Puckey explained that in saying industry needed selling he did not mean that something should be sold which was not good. Anybody who tried to push something that was not a real asset to the country was obviously doing a disservice. He himself happened to think industry was a very significant force in the country as a whole, and on that basis it needed explaining.

Perhaps "sell" was not a very good word, but once it was explained to people a little more, a better class of person might be directed to the ranks of industry. He did not necessarily say the Institution of Production Engineers was the best body to sell or explain it, but he did think the members were in as good, or a better position than anybody else to explain industry to people. They were in that happy ground between the lower and the higher side.

The comment of the previous speaker with regard to lateness seemed to be quite irrelevant, and he did not see what it had to do with the problem at all. One did not want to penalise many people on account of a small number. Certainly everybody wanted to work at the present time; he agreed entirely that there was no argument on that point.

Mr. Dewar asked whether it was not feasible to assume that in order to reduce overheads and indirects the office worker or indirect worker should be reorientated, together with the conditions in which he worked, as well as the ordinary factory hand in a factory.

At present, a draughtsman worked thirty-nine hours and a factory hand forty-four. By a factory hand he did not mean a person of lower intelligence, but one of equal intelligence, who rightly asked why there should be so great a difference in hours of work.

Then again the office worker had staff status. He was on a

superannuation scheme. No such thing existed for the factory hand. There was, therefore, a very bad balance of conditions which, if reorientated, would probably result in overheads being cut down to a considerable extent.

Secondly, there was a natural reluctance on the part of management at present to accept the possibilities and advantages of mechanisation—punch card systems, and so on. These might tend to reduce the number of people actually employed indirectly.

Thirdly, there was also reluctance on the part of management to delegate authority and responsibility. This caused a terrific overlap; if authority were delegated on a properly organised basis much waste of time would be eliminated, and at the same time each person would be able to promote his own job far more efficiently.

Mr. Puckey thought that in the United States office workers tended to arrive on the job at pretty well the same time as factory workers. They generally started earlier than in this country. In his own company a joint consultation scheme was decided upon and both sides were represented on joint factory committees. It was found that there was closer integration between staff and factory than before and the barriers were broken down. He was in favour of that, but not of bringing one side down to the other. There were some who thought all men were equal, but he did not believe that at all. Every effort should be made to level people up, but not to level down. One should be brought up to the other, provided there was justification.

He could not agree about reducing the number of indirects by mechanisation in the office. In many ways it might be true, but had Mr. Dewar seen what happened when a fully-fledged punch card system was installed? It was surprising what people found they could do with it!

He agreed with Mr. Dewar as to delegating authority. One of the biggest problems at the present time was that the staff had been pushed very much in front of the line. The latter should take a far greater share of authority than in the past. To-day staff and line were out of focus with each other.

Mr. Clark said Mr. Puckey had given a very instructive lecture. It should give production engineers to think, because certain very pertinent facts had been brought out, facts which had caused some of the previous speakers to react in a technical manner.

Mr. Puckey would no doubt be the first to agree that in the past few years the production engineer had shown that he had not a great deal to learn technically. Mr. Puckey had, however, called attention to the fact that a lot of them knew less than they should about the humanities of their calling or profession and had apologised in reply to one speaker for using the word "sell".

There was one point to which Mr. Puckey had referred on which many engineers had been heard to comment. Why is it, they asked, that I am producing the goods and other people can fill up forms and get much more credit than I do? Mr. Puckey was right in calling that attitude pessimistic. They did not sell themselves to the community. When one heard of the British Medical Association, of the Incorporated and Chartered Accountants, of the Personnel Managers—quite a new body—one realised that they had sold themselves to the community and the community realised what they were. The Production Engineers as a body should endeavour to sell themselves more to the public, to make the public realise what they had to offer. The Institution should turn its activities in that direction. Individually the members should do everything possible to increase the status of production engineers to that of comparable bodies, but he would like to hear from Mr. Puckey a little more about this corporate selling by the Institution, and about what the members should do themselves in that direction.

Mr. Puckey said it really depended on the Institution of Production Engineers—largely perhaps on the individual members—whether the Institution became known throughout the world. If they reacted technically to every particular discussion, if they looked at everything in terms of the machine tool or the cutting tool, as they had perhaps tended to do in the past, they would never sell themselves in the broader sense. They must think in bigger terms, must look at the problem not only from the point of view of the cutting tool but from the point of view of industry and the country. By the way they reacted they would show whether they were thinking in terms of managerial responsibility or in the narrower terms of technical work. It really depended on them and on the spirit of the people they elected to their Committees and Council. He could say no more than that. He was one of them and he had to accept the same responsibility.

Mr. Clark had, however, raised one point which he (Mr. Puckey) wanted to challenge. He had said that the production engineers had not much to learn technically from other people. This was not so. They had done a tremendous job in this country in the narrow sense of production engineering as it had been known in the past. But at the same time it would be found that in the production engineering industry America had gone very far ahead, farther ahead than in any other section of manufacture. On that basis they had very much more to learn in this country in order to equal what was being done by other people. If they settled down and said: "Technically, in my narrow sphere, I am just as good as anybody else," they had the wrong approach. Even if they did not want the managerial approach, they had not got past the first stage. They were not willing to compare their performance with a better

performance which might be put up elsewhere. Quite apart from self-complacency in engineering, what about the other industries? What about the broader sphere, the forty-seven million people in this country?

It reminded him of a story he had been told recently in relation to the army. One did not expect—or did not before the war—to find too much motion study in the Army. But the individuals in question happened to be engaged in trying to inaugurate what one might call production engineering processes in the Army. The incident might have happened in industry.

On one occasion an attempt was being made to increase the rate of fire on a particular field gun, and it was not understood why a certain member of the gun crew was always standing in a certain place. There was nothing for him to do there. It took a long time to discover that in the early days that was where the horse stood!

There were still a few horses, or horses' positions, in industry. While he agreed with what Mr. Clark had said latterly, therefore, he must challenge him on the first part of his statement.

Mr. Clark said he was not at all complacent in his remarks as a production engineer. He was only emphasising that production engineers, in keeping their noses to the grindstone, tended to lose sight of the broader principles and therefore tied themselves down.

Mr. Kirchner said he felt Mr. Puckey had got away with it far too easily. The pendulum should swing equally both ways, but at the moment it was very high up in the air on one side.

First of all, with regard to the Institution, he was in complete disagreement with Mr. Puckey as to this question of management being so important to the members. But before dealing with that, he wanted to speak on another matter. Mr. Puckey had said there were 50,000 engineering companies in this country. They all knew, however, that there were engineering companies and engineering companies. From their knowledge of some of the smaller ones, did they really feel Mr. Puckey's statement, that there must be at least one member of each company who was eligible for membership of the Institution, was correct? From his own knowledge he would say definitely no.

Coming back to management and to the question of whether the Institution should interest itself purely in technical problems, he personally was one of the old-fashioned ones, if they liked, and like Mr. Puckey he could claim to be an old member of some of the various committees. What he himself felt was that a production engineer was a production engineer and should know what he was talking about. Personally he had no time whatever for the man who did not know what he was talking about. It a man was going to take charge of a factory and walk through it and ask questions as to a job in this or that department, or why this or that machine

was not working satisfactorily, then he must know why himself. He asks his questions just to find out whether the other man knows what he is talking about.

Taking that as a basic point, it would be far better for the Institution to concern itself with the problems of production. Jig and tool design, machine tool design and such things were their bread and butter. They were production engineers. Mr. Puckey would probably ask whether that meant they were not to interest themselves in becoming managers. Certainly it did. He himself would say categorically that if a man knew what he was talking about and if he had the qualities of a manager—and these could not be instilled in him by training—he was either a manager or he was not.

There were people who issued instructions and nothing happened at all. There were others who issued instructions and if they were not carried out found out why and saw that they were carried out. There were also the real managers, whose instructions were carried out because they were looked up to as leaders. That was the point. These things could not be instilled in a man by training. He had either got them or he had not.

Mr. Kirchner thought it was absolutely futile to compare this country with America. It was simply waste of time to talk about their journals. He would be the first to admit that the American journals were very well produced—their advertisements, their editorial matter, and so on. But it must be remembered that an Englishman was an Englishman. When he read something he flicked the pages over; that was the way he was made. The American devoured them, and therefore he was provided with something that he could devour. If any of his hearers had any ideas of publishing a magazine with all those wonderful advertisements, they could save their money, because most people would just take a look at it and put it down, though there might be a few who would really read it.

The same thing applied to the man in the shop. The Englishman was phlegmatic and said to himself: "Well, is it worth while?" The American has only to sniff an idea and he will have a go at it.

Mr. Kirchner said he did not want to wave the Union Jack or anything like that, but he would like to remind them that in spite of what their American friends could do, their own stolid and perhaps rather slow nation could still produce some of the very best articles in the world. They had only to think of things like the Rolls Royce car, or British air engines and so on. Above all, let them keep their feet on the ground.

Mr. Puckey said he had always believed that there should be not only an accelerator but also a brake on any piece of moving apparatus. Having known Mr. Kirchner for a long time, he thought

him a very effective brake. That was a very admirable trait in human nature. Mr. Kirchner really did seem to have his feet firmly planted—in mid-air !

He did want to pay full justice to Mr. Kirchner because so much of what he had said was true. After all, a man could not speak for so long and say nothing. Incidentally, he (Mr. Puckey) would like to apologise to the Scots on behalf of Mr. Kirchner, who had spoken of the English. His own company had a factory in Scotland, and he himself had long ago given up using the word "English".

Let there be no mistake—so far as he was concerned he was absolutely convinced—and he hoped he had said nothing which would put any other idea into anybody's mind—that it was necessary for the manager to have first of all a first-class technical training. He had had a reasonable technical training. He prided himself that when he went round a factory he could ask pertinent questions. One or two of those present could perhaps substantiate that from their own experience.

The fact remained that a reasonable technical background was absolutely essential, and nothing he had said should be regarded as meaning that people should simply butt in as managers who had had no background in one or other of the technical jobs. Technical training might include accountancy, or some other form of technical business, not necessarily working on the machine tool. The essence of the matter was that from that technical background a man had the greater opportunity of expanding, of entering management.

Mr. Kirchner and he could both call themselves managers in one sphere or another, and he agreed with Mr. Kirchner that if a man in a shop received instructions from someone in whom he had confidence, he would carry out those instructions. He did not agree, however, with Mr. Kirchner's use of the word "instruction". That in itself might be the negation of good management ; he was a very firm believer in letting other people do things his own way !

He did agree that a good manager was a man in whom the workers had confidence ; one whom they knew would recognise a good job. But that was not an argument against what he had been saying. On the contrary, it supported his remarks.

The important thing was that with a technical background they could study the fundamentals of their job, and could go very much further along the road than they had gone so far.

Mr. Venessy said that Mr. Puckey had just noted very clearly the difference in England and America as to the undercurrent of change. In his own opinion what really put the brake on changes on this side was the archaic tax position, and as no one had mentioned that, he would like to make a few remarks about it.

Until recently wear and tear allowances on machines were such that only a person interested in goodwill and not in profit could

really replace his obsolete plant, and even to-day people did not ask whether or not a thing was in good order. They asked whether it was capital or revenue. Although Mr. Puckey had kept the discussion on broad lines, he had not really made them broad enough. If he talked management, he must immediately talk finance. If he talked finance, he must talk economics, and if he talked economics, he must talk politics. There was nothing higher than politics, though he did not doubt that everyone at the present time would try to reverse the scale. However, looking at the whole series, from politics to economics to finance to management, you came to the production engineer. You might say he had the knowledge. Why did he not go into the next layer?

If a man tried to interest the higher management level, he was regarded as rather a nuisance. Mr. Puckey would explain that by saying that if the man persisted long enough, he would be heard. No doubt the answer was that Mr. Puckey was prepared to defend himself to the point at which the person became a nuisance, because he was good at it. But the average engineer who concentrated all day on a definite problem, when he went outside his own sphere and tried to do something larger, found his knowledge was not adequate and was, of course, easy meat for the Puckeys.

The point was this: while he agreed with Mr. Puckey that production engineers should be carried out of the technical into the managerial stage, Mr. Puckey should make a study of the difficulties and see how many had been actually removed, even in his own works, because it was quite easy to think you had removed them and then find some person sitting on quite a good idea because he was completely and utterly blocked.

That led to the last question. Exactly who, in a fairly large organisation, did Mr. Puckey think should control the production engineer—the works manager, or the next level, the general management? And if a production engineer did try to take on a higher level, even plain simple works management, he ran up against what might be called the mumbo-jumbo of the Sales Department. If the latter was not sufficiently alert to make him think he was on the wrong track, the Board of Directors had to be careful, because if they had either to support the Sales Department or the production engineer, they would make a noise like supporting the latter and proceed to support the former.

Mr. Puckey said that covered a lot of ground. Mr. Venessy had asked him to describe the tax position. Quite obviously to the individual, taxation was pretty horrible. As to obsolete machinery and income tax allowances and so on, it was fair to say that quite a degree of relief had in fact been given over recent years, to people who were willing to seize that particular relief and turn it into significant effect. There were certain additional allowances in

terms of research, new equipment, and so on. They had not gone so far as some people would like in giving the right sort of incentive to have better equipment, but the fact remained that they had gone along the right road.

He had referred earlier to the White Paper on Capital Investment in 1948. They ought to read it—it contained some significant facts. He did not know whether they realised that for the next year or so, for instance, there was actually going to be at least 23 per cent. reduction in the investment of so-called private enterprise in new equipment. In other words, it would not be possible to purchase new equipment so readily, because priorities were going in other directions. It was unfortunate that there was actually going to be an increase in the amount of investment in Government or semi-Government activities. The production engineer would have to do with fewer new machines in future. Relatively the problem would be to try to “make do and mend”, to get very much more out of the existing stuff than in the past; to get more out of the power press, lathe, or whatever it was. In his own view what was wanted was not that the individual machines should do more, but that there should be a better organisation of work surrounding them. In a way the problem was being made rather less difficult for them in one sense, because it would not be possible to buy machines so readily, and they would have to make do. That was the trend and the White Paper was well worth studying.

As the last speaker had said, the problem bordered very much on politics. It was quite impossible to get away from the sphere of politics in talking of the broader, managerial aspects of a job. Economics was affected by politics and you had to take the broader outlook. It was to be hoped that this would lead to the common points, to the middle road, and that both sides would arrive at points of view not very far removed from one another.

Mr. Venessy had referred to the mumbo-jumbo of Sales. Anybody who talked about the mumbo-jumbo of other people invited a reaction on similar lines. But the fact remained that the more managerial minded you became the more barriers you had to break down between your activity and that of other people; the more you realised that organisation meant all departments pulling together. Let them have a laugh, by all means, but when it came to the serious side of the business, the more managerial-minded you became, the more you had to break down barriers, and on the other side of the barrier you found the other bloke was very much like yourself.

Mr. Hemmell said he spoke as a member of the Institution and also as a member of the Institute of Industrial Administration. To his mind, while Mr. Puckey's address was admirable in its content, he had committed two sins, one of omission and the other

of commission. The sin of omission was that he had not mentioned, throughout the whole of his talk, the formation of the new British Institute of Management. Nor had he mentioned the efforts that were being made by Government and technical institutions to develop some form of syllabus for training for management. The final examination as proposed in the White Paper was for eight subjects, six specialised subjects of interest to the Institution and two specific subjects, Principles and Practice of Management. In that way technically trained men in their own professions would acquire a wide knowledge of management.

The second sin of Mr. Puckey was his attitude towards consultants. He had taken the view that was perhaps commonly accepted that the consultant was the expert who knew more and more about less and less. But the consultant did perform a very useful function, particularly as far as the Institution of Production Engineers was concerned, because he directed his activities not only to the engineering industry, but to the wider fields of other industries. It was through his activities, his insistence on good management practice, that the technique of production engineering would be carried to those other industries. It was through his activities that the demand would grow for production engineers to enter those industries.

Mr. Puckey said he was sorry he had not mentioned these two matters. He knew about the formation of the British Institute of Management and the background leading up to its formation. He knew many of its members and a good deal of what it hoped to do.

It must, however, be admitted first of all that the Institute was a very embryonic body. It had a tremendous lot to do, even to make a place for itself. But he himself was more concerned at the present time about the existing bodies. For example, at the moment the approach of the Institute of Industrial Administration was fundamentally more important. The I.I.A. had done sterling work in the field of management up to date, had been for years trying to help in a small way, and had achieved a great deal. He had mentioned it several times. He did not think he owed any apology to the British Institute ; it had yet to prove itself.

He had not mentioned the various training schemes for management. He had simply tried to put management over to them in the sense of the opportunities it offered. If they liked the look of what was there, it was up to them to go and find out what sort of technical colleges there were ; to get information on training ; to see whether they could get more inside their own company or whether they should go outside. If they were interested in this kind of progress—Mr. Kirchner would not call it progress—then they could find out for themselves.

As far as consultants were concerned, they were springing up

like weeds in summer. After all, some weeds were very nice—he had quite a lot in his own garden. One of the members present that evening had once said that the ability of an industry was in inverse ratio to the number of consultants, because it was possible that if you had a very large number of consultants the industry might be less rather than more efficient. That was a point of view to which he could not fully subscribe. He thought a tremendous lot of good could be done by consultants and his own company had used them in one form or another.

He also knew “consultant” could be another name for “quack” unless controlled. Some firms had a good name and good people. He would not employ the services of others free of charge.

If Mr. Venessy felt he should have dealt more fully with this matter, he could only say he was sorry but he just did not have the time.

The Chairman pointed out that as the hour was late, the time had come to close the discussion. He therefore called upon Mr. Gordon England to move a vote of thanks to Mr. Puckey.

Mr. Gordon England said he did not intend to speak for long, in view of the time factor. He felt sure, however, that everyone would think less than justice had been extended to Mr. Puckey if he did not thank him most sincerely on behalf of them all for his courage, his clarity and his charity in dealing with his subject. His sense of humour and his penetrating analysis of the situation should also be dwelt upon at length. A tremendous debt of gratitude was owing to him for his paper, and Mr. Gordon England was one of those who most wholeheartedly accepted the principle which Mr. Puckey had been trying to get over to them. The Institution—and many of the members present had heard him say this in the past—was not taking advantage of the great opportunities that existed. If the Institution knew its business, it would be the premier institution in the country within the next ten years. The potential was terrific and they must remember that this was really what Mr. Puckey had been trying to tell them.

Naturally the point that management was mainly inspiration was extremely true. The converse, of course, was perspiration. They wanted less perspiration and a great deal more inspiration.

Mr. Puckey was extremely kind to their old friend Kirchner. Frankly, though, for a backwoodsman, the latter had really surprised him. If he might be allowed a play on words, there was something “puckish” in what he had said. He could not believe Mr. Kirchner really believed half he said, because his own record belied the veracity of his statements.

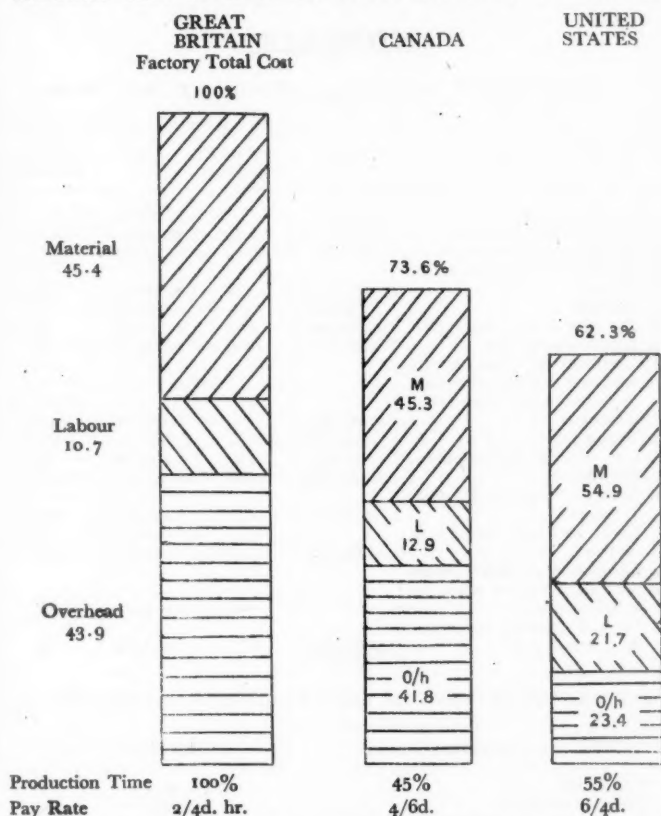
They were greatly indebted to Mr. Puckey and the best way in which they could show their indebtedness would be for them to go away and dwell on the paper they had heard, realise what it was

all about, and then set about the business of making the Institution what it ought to be, or nearer to what it ought to be, than it was at present. As a very old member of the Institution—one who had served it fairly well, he thought, and energetically—he believed they could do an immense amount more than they had ever started to think of doing. The present time offered them an opportunity to go forward. Mr. Puckey's paper would prove, if he was not far out, a turning-point in the affairs of the Institution. He was sure he carried everybody with him in wishing Mr. Puckey every possible success in the future, and expressing their unbounded gratitude for having stimulated them as he had done that evening.

Mr. Puckey thanked the members for their response to his paper. He hoped they would take to heart the invitation from Mr. Gordon England to go away and try to do something in the light of present difficulties. It would not be a bad thing, in these difficult days, to leave them with two thoughts: "What Man has done he can do again!" and "What Man has done, he can do better!"

APPENDIX "A"

FACTORY COST COMPARISON OF AN ENGINEERING PRODUCT



U.S.A. PRODUCTIVITY OF DIRECT LABOUR

	Great Britain	U.S.A.
Agriculture	100	125
Textiles and apparel	100	150
Food, drink and tobacco	100	150
Building and Construction	100	150
Mining	100	250
Non-metal Manufacturing and Utilities	100	250
Metal working	100	300

(Oxford University Institute of Statistics, July, 1946, T. Barna.)

APPENDIX "B"**EMPLOYMENT. DISTRIBUTION OF MANPOWER IN GREAT BRITAIN**

	1939	% of working population	1947	% of working population
1. <i>Total population</i>	47,700,000		49,000,000	
2. <i>Total working population</i> ...	19,750,000	100%	20,357,000	100%
3. <i>Manfg. industries, total</i> ...	6,474,000	32%	6,836,000	33%
4. <i>Agriculture, horticulture and fishing</i>	950,000	4%	1,082,000	5%
5. <i>Mining</i>	761,000	3%	738,000	3%
6. <i>Building & civil eng'g</i> ...	1,206,000	6%	1,143,000	5%
7. <i>Distributive trades</i>	2,160,000	10%	1,803,000	8%
8. <i>Commerce & finance, pro- fessional & personal service, entertainments, catering, laundries</i>	1,101,000	5%	1,114,000	5%
9. <i>Transport</i>	410,000	2%	500,000	2%
10. <i>Gas, water & elect. supply</i> ...	215,000	1%	232,000	1%
11. <i>Civil Service</i>	1,385,000	7%	2,043,000	10%
12. <i>Armed Forces & Aux. Services</i>	480,000	2%	1,292,000	6%
13. <i>Civil Defence, N.F.S. & Police</i>	80,000	0.4%	91,000	0.4%
14. <i>Ex-members of H.M. Forces who have not yet taken up employment</i>	—	—	155,000	0.6%
15. <i>Insured persons registered as unemployed</i>	1,270,000	6%	260,000	1%

A PARTIAL BREAKDOWN OF MANUFACTURING INDUSTRIES 1947

1. <i>TOTAL manufacturing industries</i>	6,836,000	100%
2. <i>Chemicals</i>	349,000	5%
3. <i>Metal manufacture</i>	358,000	5%
4. <i>Engineering and vehicle construction</i>	1,883,000	27%
5. <i>Other metal industries</i>	993,000	14%
6. <i>Textiles and clothing</i>	1,293,000	18%
7. <i>Food and drink</i>	564,000	8%

(All figures are approximate.)

APPENDIX "C"**PROGRESS OF CODE No. 600017, SUPPORT YOKE**

	<i>Process Time per Piece Hours</i>	<i>Time in Store or Waiting on Floor</i>
Material ordered, 18.7.46		
Material received, 16.1.47		
Material issued to Shop, 11.11.47		10 months
Material on floor		48 hours
Crop, 13.11.47	·002	
Wait between operations		96 hours
Form	·003	
Wait between operations		24 hours
Pierce	·003	
Wait between operations		48 hours
Final form	·002	
Wait between operations		336 hours
Degrease	·050	
Cadmium Plate	·031	
Wait on floor for usage on assembly line		240 hours
Assemble to cleaner }	1·000	
Inspect, test, pack }		
Convey to Stores	·220	
In Stores waiting despatch		5 hours
	1·311	797 hours

SUMMARY

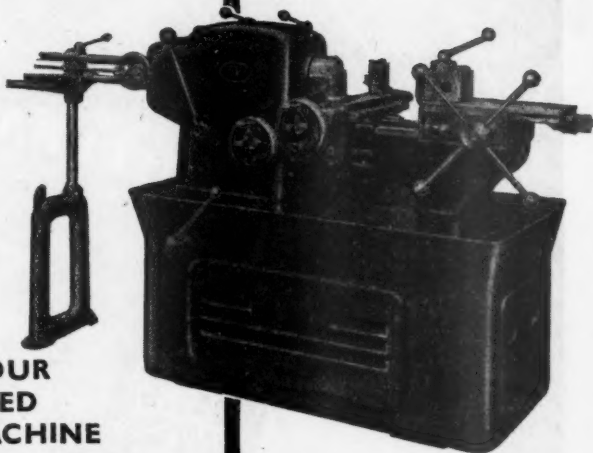
Material stored	10 months=	7200 hours
Waiting time		797 hours
Actual time on process		1·3 hours
		<u>7998·3 hours</u>

Notes

Notes

Notes

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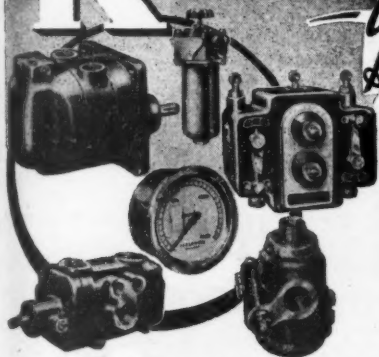
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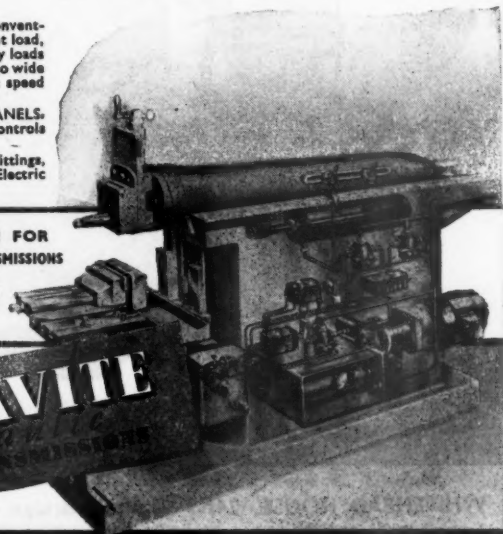
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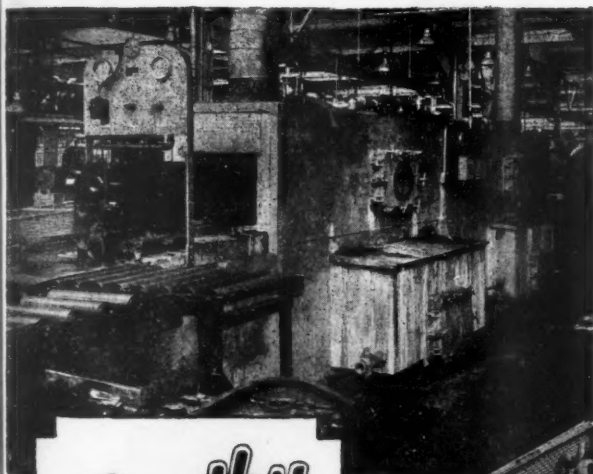


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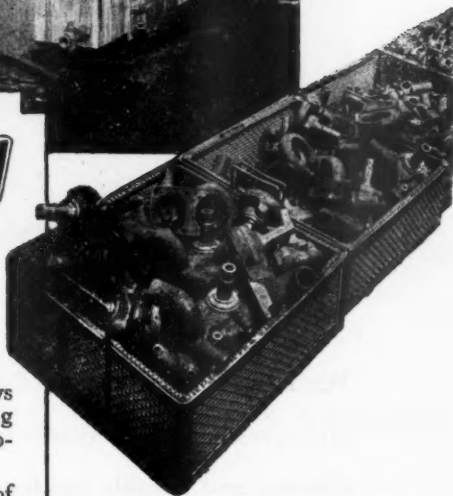


Bratby

**INDUSTRIAL
CLEANING
MACHINES**

This illustration shows
a machine cleaning
crank cases in the pro-
duction line.

It is equally capable of
cleaning small parts in
baskets.



Photographs by courtesy of "Machinery."

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Designed and manufactured by :

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AIR COMPRESSORS



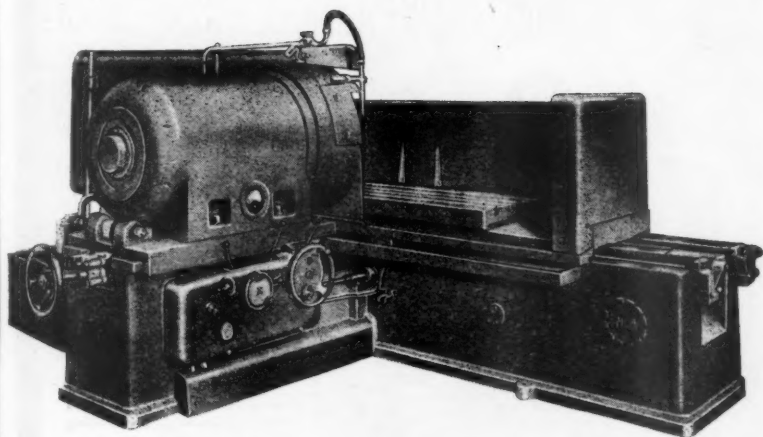
We have standard types for all capacities and pressures and can supply the most efficient and reliable machine for any duty.

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Telegrams: "Reavell, Ipswich."

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SNOW *Surface Grinders*



GA.32 HORIZONTAL HEAVY FACE GRINDER

Heavy duty segmental wheel face grinder.

TABLE CAPACITY : 62 in. by 24 in.

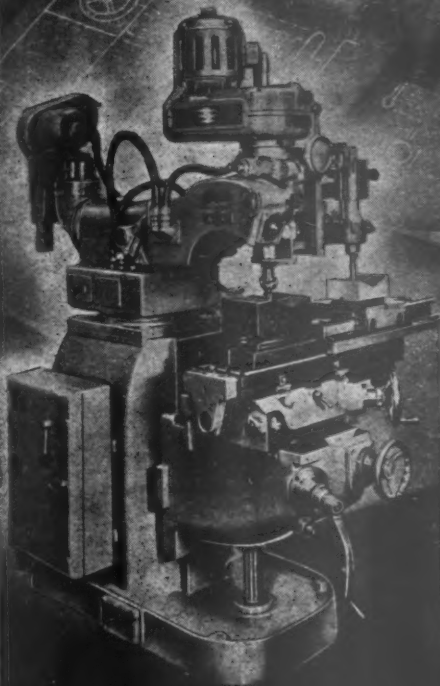
RANGE OF SIZES : 42 in. by 13½ in. to 116 in. by 24 in.

SNOW & CO. LTD. SHEFFIELD

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8" x 18" TOOL & DIE MILLING MACHINE



With
AUTOMATIC
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For
ACCURATE
DUPLICATION OF
PROFILE SHAPES

This machine has been particularly designed for rapid and economical production of plastic moulds, permanent moulds, metal patterns, die casting dies, small drop forgings and other types of work requiring accurately shaped contours.

Excellent visibility of both work and model together with convenient location of all controls reduce physical effort to a minimum.

Details of the many unique features which reduce machining time are available on request.

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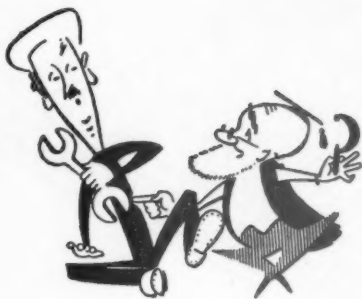
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TYPE U.P.H. 10/24

PRECIMAX = PRECision with MAXimum output
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Will Might, the Mill-wright
— and the PROF.
set-too No. FOUR

QUIET, please! Stop all that machinery. This morning I propose to release to you a few further scintillations from my, ahem! modest yet unique store of scientific facts, applied particularly to the subject of driving-belts. Now driving-belts at their best are always made by Hendrys' of Glasgow, and made of leather. And what is leather, you may ask. Leather is a fibrous fabric employed by nature for the protection of the essential mechanism of the bovine species. As Macmillan said in his immortal treatise . . ."

"Pardon me, Prof. Speaking of Macmillan, and bearing in mind

Macadam's advice to the Romans on Roadmaking and the fact that Macintosh showed Scotsmen the possibilities of getting wet inside without getting wet outside even on a rainy day, what can you tell us about Machinery?"

"I am afraid that there is practically nothing that I can tell you about MAC HINERY".

"Good for you, Prof. We've thought all along that MACHINERY was a closed book to you! But, hoots! Mon, you've got it right about Hendrys'. Like all the Macs, Hendrys' are as sound as Machinery itself."

Hendrys'

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The removal of drawing pastes and pressing oils is not usually an easy degreasing operation, due to the tenacious nature of these compounds. With SOLVEX, however, the operation can be done quickly and without holding up production. Simple immersion for 7 to 12 minutes in the SOLVEX bath, followed by a quick rinse in hot water is all that is required.

SOLVEX requires no elaborate equipment, is non-inflammable, non-toxic and can be used repeatedly without losing its efficiency. Write for details.

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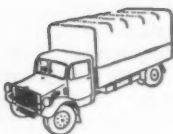
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Perhaps we're biased
but to us
this part
is greater
than



this whole



NOWADAYS the carburettor of almost every car is, like this one,* made by zinc alloy pressure die casting.

Why the part is die cast

No other production method copes as economically with the requirements of a carburettor as does die casting. The dead accuracy of the process ensures the precise location of jets, valves and moving parts, and thus smooth air flow and the exact proportioning of the mixture. The accurately cored holes dispense with drilling and the intricate shapes need no machining.

Other car equipment too

The modern car contains scores of zinc alloy die castings. Components generally made—in whole or in part—by zinc alloy die casting include stressed parts in the chassis (such as shock absorber bodies), steering wheel bosses, and body fittings such as door handles, radiator grilles and boot hinges.

Some facts about zinc alloy die casting

Speed is the essence of the die casting process—the shortest distance between raw material and finished product. Zinc

alloys are the most widely used metals for die casting because they ensure:

STRENGTH: Good mechanical properties for stressed components.

ACCURACY: Castings can be made practically to finished dimensions and need little or no machining.

STABILITY: Close tolerances are maintained throughout the life of the casting.

Hence the widespread war-time use of zinc alloy die casting for gun sights, periscopes, tank carburettors, etc.

British Standard 1004

Alloys conforming to B.S.1004 should be specified for all applications where strength, accuracy and stability are essential.

ZADCA

ZINC ALLOY DIE CASTERS ASSOCIATION
LINCOLN HOUSE, TURL STREET, OXFORD
TELEPHONE: 48088

ZINC ALLOY DIE CASTINGS PLAY AN IMPORTANT PART IN THE EXPORT MARKET
Enquiries welcome. Publications on request.

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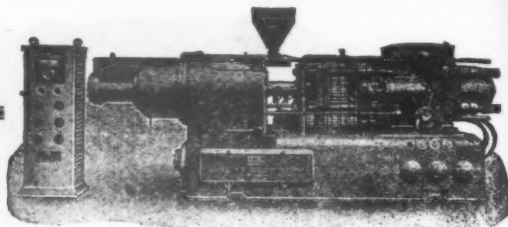
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Established 1908



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PLASTIC MOULDING EQUIPMENT

E.M.B. No. 9B INJECTION MOULDER has, since its inception, achieved an enviable reputation among moulding manufacturers.

It is a fast reliable machine in which the heating is under accurate automatic control.

E.M.B. DIE CASTING MACHINES are well known to die casters and offer a simple efficient machine for the manufacture of inserts and bases to be subsequently covered with plastic material.

The new E.M.B.W. MOULDING PRESSES embody many up-to-date features.

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Made in up-stroke and down-stroke types!—25 to 160 tons.

ELECTRICALLY HEATED PLATENS have a number of special features to ensure accurate and independent heating and control of the two platens, enabling them to be worked at the same or different temperatures as required.

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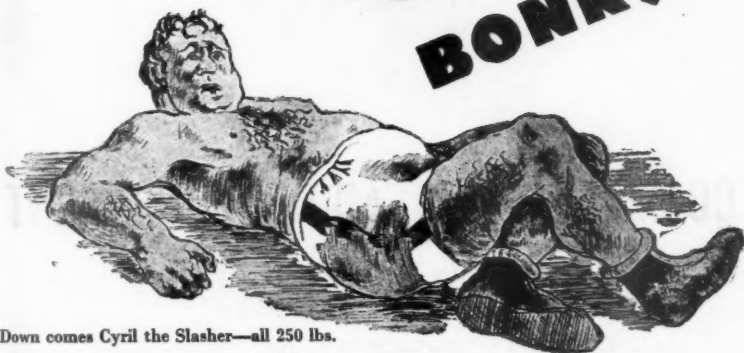
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of him—him bom in the middle of Godfrey's tum.

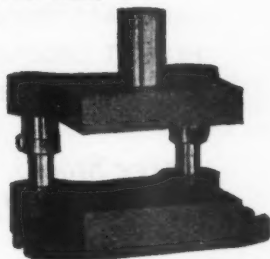
Godfrey wears a pained look but don't you be

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likes it! He's built to take it and go on taking

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C.R.C. 52



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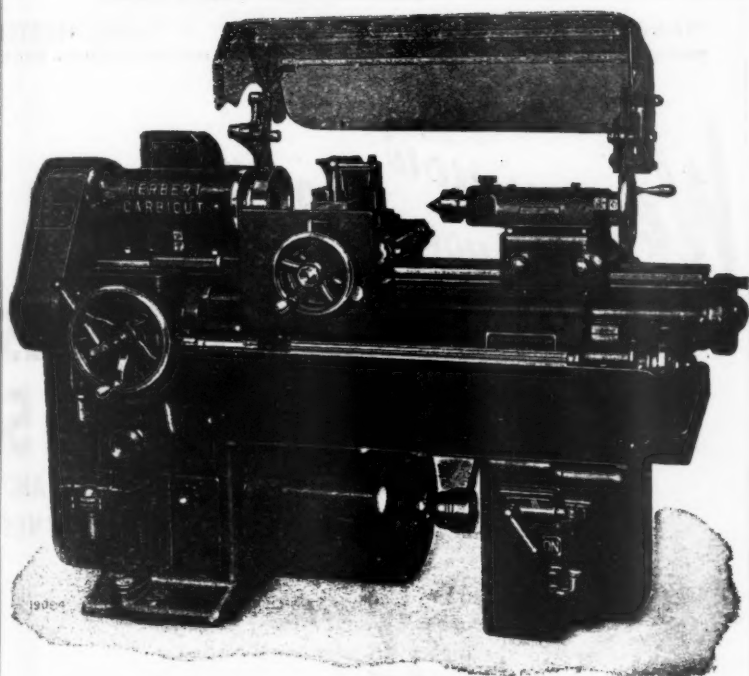
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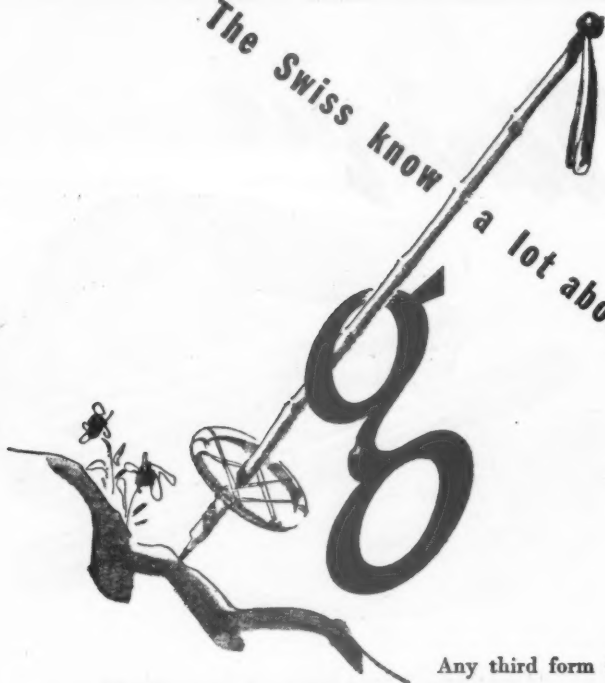


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. . . make light work of it with



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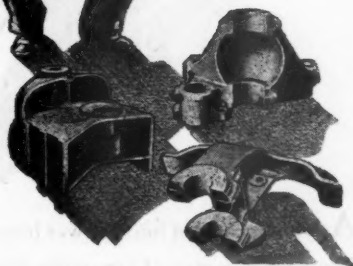
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The Attributes of the MODERN Steel CASTING



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For parts of complicated shape a Steel Casting is, without doubt, the most economical form of construction.

Molten Steel will flow into any shape, however complex, for which it is practicable to make a pattern and a mould. Thickness of sections and even individual members can be varied, so that the volume of metal does not exceed that which is necessary to provide the essential stress and impact resistance, in each integral part of the casting.

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for this work stuff,
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Wimet Brand Tungsten Carbide



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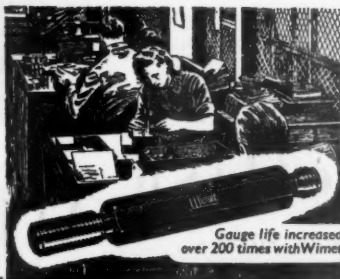


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The result... your component

**AT
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Gauge life increased
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Britain's future depends on her factories' ability to produce more in less time, to reduce costs and yet maintain high standards of accuracy and finish. The part Wickman plays is to understand your production problems clearly, and iron out causes of 'hold-up.'

Read this success story. A Wimet plug gauge has been continuously employed on checking internally ground bores in nickel chrome gears for fifteen months. During this time it has made a daily check on 350 components and yet still maintains strict manufacturing limits. Steel gauges made to the same degree of accuracy had previously to be replaced every two days.

Why not learn how Wimet gauges, dies and wear-resistant parts can reduce costs and step-up production in your branch of industry? A Wimet expert would be glad to give you factual evidence—all part of Wickman's complete engineering service, which embraces your problems from drawing board to finished product.

Write today.

PRICES SLASHED!
Send now for
Catalogue ST 55

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COVENTRY · ENGLAND**

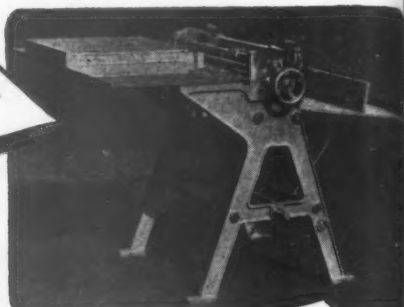
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handtools
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in they had
here is an
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**A COMPLETE
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ROTARY PERFORATING MACHINE
MANUFACTURED FOR
JAMES HALL & SONS,
WEST BROMWICH

**JIGS AND TOOLS - PRESS TOOLS
AND DIES - MACHINERY OF ALL
TYPES - SHEET METAL WORK -
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And NOW the

PULTRA 10

WATCH LATHE



PULTRA MICRO-LATHES

have earned a reputation for performing small precision work with utmost accuracy. The Pultra 10 Watch Lathe is now in full production and can be obtained through merchants and accredited dealers.

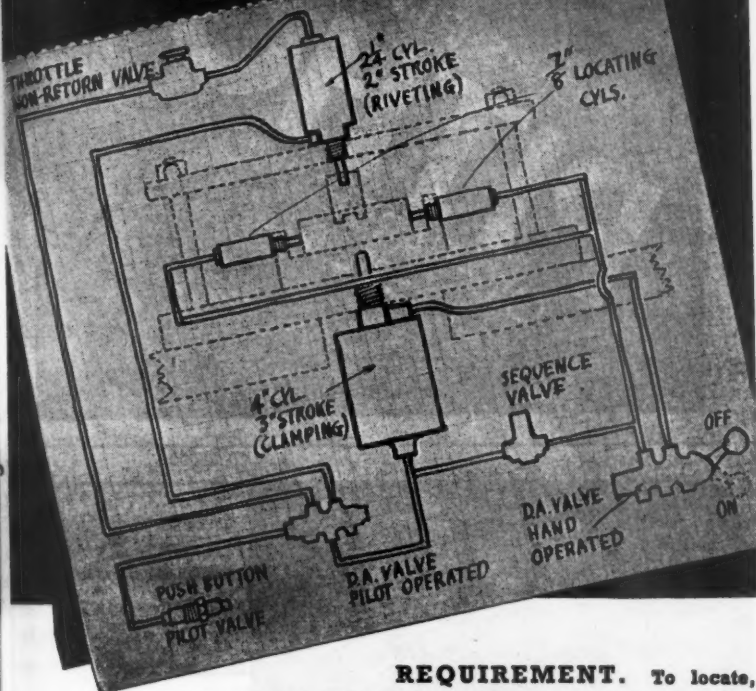


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Air aids production — a Maxam client's problem



REQUIREMENT. To locate, clamp and rivet in fixture. Riveting cylinder to be inoperative if component is not clamped and operator's right hand not on valve. Operator's left hand to control riveting operation — thereby engaging both hands as a safety measure.

FUNCTION. Hand-operated valve controls locating and clamping with sequence. Push-button pilot-valve operates pilot-controlled valve and riveting cylinder.

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For Gauges, Taps and
all Precision Tools.
Ensures maximum
degree of accuracy
after hardening.

NON-SHRINK PITHO OIL-HARDENING STEEL

Steel
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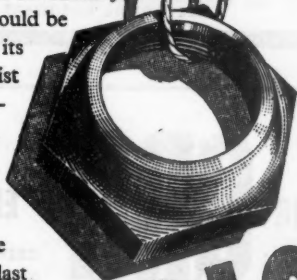
CASE NO. 2

SPECIAL LOCKING NUTMATERIAL — FREECUTTING STEEL 1.3" A/F HEXAGON
on SIX SPINDLE AUTOMATIC LATHEORDINARY FREECUTTING STEEL
Spindle Speed—365 r.p.m. Cycle Time—27 secs. Coolant—OilMILLS LEDLOY FREECUTTING STEEL
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PRODUCTION RATE INCREASED BY 38.5%

If this Locking
Nut were handed round
a jury box without its identity
card, twelve good men would be

truly puzzled to discover the secret of its success. But it doesn't take a metallurgist to understand the story on that label — Mills Ledloy Steel has given this nut a phenomenal advantage over its rival. This is the result of actual production under machine shop conditions — other results have proved even more striking. Moreover, machine tools last decidedly longer with Mills Ledloy steel than with other steels.



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BREDBURY STEEL WORKS.

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LEDLOY is the name given to steels into which a small percentage of lead has been introduced by a special process. All steels (carbon and alloy) can be so treated during their manufacture.

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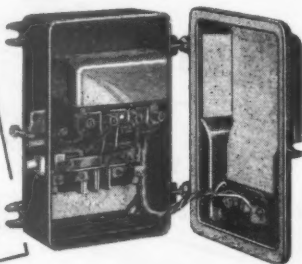
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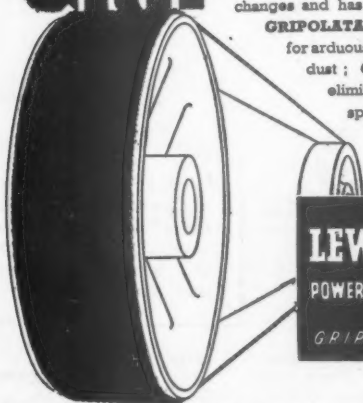
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GRIPOLATA Belting is particularly suitable for arduous working conditions in damp or dust ; **GRIPOLESTIC** Endless Belts, eliminate fasteners and run at high speeds even over small pulleys.
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FOR USERS OF ZINC ALLOY PRESSURE DIE-CASTINGS

Due to the change over from wartime conditions there is a considerable amount of secondary and re-melted Zinc Alloy in circulation . . .

Inter-crystalline corrosion caused through an impurity content of even a few thousandths of 1%, endangers the life of your castings. Protect **YOUR** interests by taking **TWO STEPS . . .**

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Specify Zinc Alloy Die-castings which conform to B.S.S. 1004 Alloy A or Alloy B.

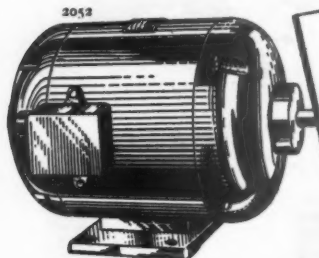
STEP No 2

Contract to have a reliable metallurgical test carried out, as a routine monthly check on the specification of Zinc-Alloy Die-castings taken at random from incoming supplies.

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Carter Small Power Electric Motors will fit the jobs you have in hand or those you have in mind. Available in H.P. from 1/200 to 1, they have been designed to fill a specific purpose and built to give lasting service. Write to-day for further information.

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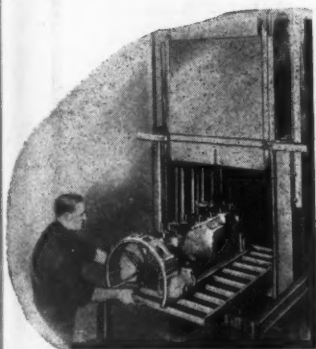
Speed the flow of material through your works, avoiding congestion, banishing bottlenecks, keeping every item of production plant at top line efficiency. Electrify your works haulage with 'Electricar' industrial trucks. Swift, silent, cheap to run, easy to maintain, many 'Electricars' are still working after 20 years service. A youth or girl can drive one and release seven men for productive work.

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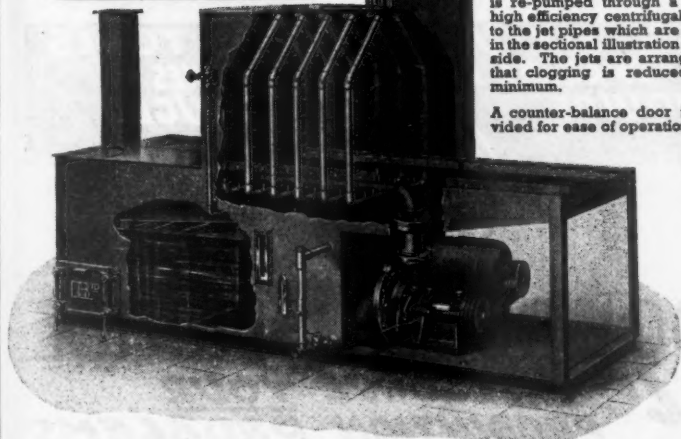
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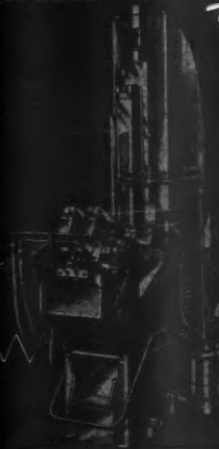
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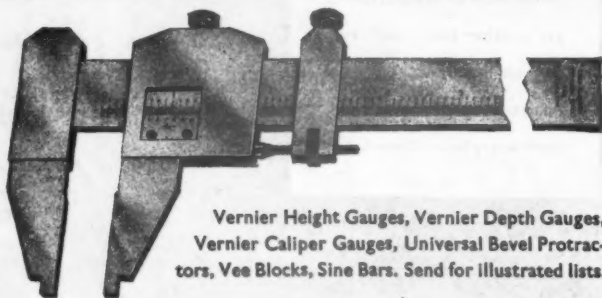
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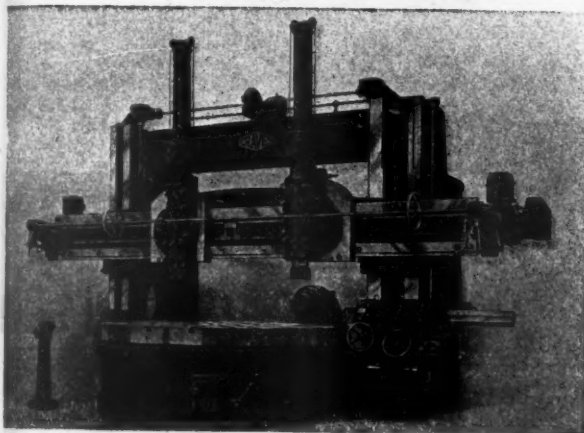
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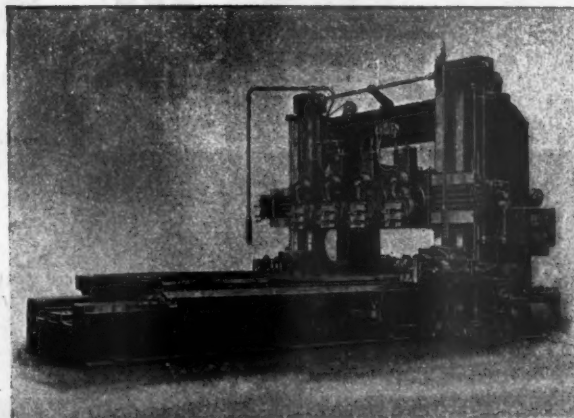
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INDEX TO ADVERTISEMENTS

	Page		Page
Acheson Colloids, Ltd.	xxvii	Imperial Chemical Industries, Ltd.	—
Arnott & Harrison, Ltd.	—	Keelavite Rotary Pumps & Motors, Ltd.	xviii
Asquith, Wm. Ltd.	—	King, Geo. W. Ltd.	—
Automatic Coil Winder Electrical and Equip- ment Co., Ltd.	xvi	Lang, John & Sons, Ltd.	vi
Barber & Colman, Ltd.	viii	Lewis & Tylor, Ltd.	xlii
Bilton's Abrasives, Ltd.	—	Lloyd, Richard Ltd.	—
Birlec, Ltd.	—	Lund, John Ltd.	xxiii
Bratby & Hinchliffe, Ltd.	xix	Manchester Repetition Engineers, Ltd.	—
British Steel Founders' Associa- tion	xxv	Mechanical Handling	—
Burton Griffiths & Co., Ltd.	vii	Ministry of Fuel & Power	—
Carter Electrical Co., Ltd.	xliv	Mollart Engineering Co., Ltd.	—
Catmur Machine Tool Corporation, Ltd.	xviii	Motor Gear & Engineering Co., Ltd.	I
Churchill, Charles & Co., Ltd.	xxii	Newall, A. P. & Co., Ltd.	xxiii
Cincinnati Milling Machines, Ltd.	xlvij	Norton Grinding Wheel Co., Ltd.	—
Climax Rock Drill and Engineering Works, Ltd.	xxix	Parkinson, J. & Son	v
Colley Bros. (Tools) Ltd.	—	Perry Barr Metal Co. Ltd.	—
Collis, J. & Sons, Ltd.	—	Pitman, Sir Isaac & Sons, Ltd.	—
Constable & Co., Ltd.	—	Protolite, Ltd.	—
Coventry Gauge & Tool Co., Ltd.	xiv	Pryor, Edward & Son, Ltd.	—
Craven Bros. (Manchester) Ltd.	xlix	Pultra, Ltd.	xxviii
Crittall, Richard & Co., Ltd.	—	Randalrak, Ltd.	—
Daniels, T. H. & J. Ltd.	—	Ratcliffe Tool Co., Ltd.	xlvi
Dawson Bros., Ltd.	xlv	Reavell & Co., Ltd.	xx
Dean, Smith & Grace, Ltd.	xii	Sanderson Bros. & Newbould, Ltd.	xi
Desoutter Bros. Ltd.	xxix, xxv	Scottish Aviation Ltd.	xxviii
Donovan Electrical Co., Ltd.	xlii	Sheet Metal Technicians, Ltd.	li
Drummond Asquith (Sales) Ltd.	xi	Sheffield Twist Drill & Steel Co., Ltd., The ..	—
Electricars, Crompton Parkinson Ltd.	xlv	Snow & Co., Ltd.	xxi
E.M.B. Co., Ltd.	xxviii	Sunbeam Anti-Corrosives, Ltd.	xlvi
English Numbering Machines, Ltd.	—	Sundstrand Pneumatic Sanders (Britain) Ltd.	—
Exors. of James Mills, Ltd.	xli	Taylor & Jones, Ltd.	—
Firth, Thos. & Brown, John Ltd.	—	Technically Controlled Castings Group, The ..	xlviii
Flame Hardeners Ltd.	I	Tecnaphot, Ltd.	li
Fletcher Miller, Ltd.	xxv	Timbrell & Wright Machine Tool & Engineer- ing Co., Ltd.	xv
G.P.A. Tools & Gauges, Ltd.	xxii	Towler Bros. (Patents) Ltd.	—
Gray & Rushton (Precision Tools) Ltd.	xlviii	Triefus & Co. Ltd.	iii
Guylee, Frank & Son, Ltd.	Inside Back Cover	Unbrako Socket Screw Co., Ltd.	Inside Front Cover
Hall, Matthew & Co., Ltd.	xlvi	Universal Tools, Ltd.	xi
Hendry, James Ltd.	xxiv	Vaughan, Edgar & Co., Ltd.	—
Herbert, Alfred Ltd.	xxx, xxxi	Ward, H. W. & Co., Ltd.	iv
High Duty Alloys, Ltd.	xxxiv	Watts, E. R. & Son, Ltd.	—
Holman Bros. Ltd.	Back Cover	Wickman, A. C. Ltd.	iii, xxvii
Hoover, Ltd.	x	Wolverhampton Die Casting Co., Ltd.	xliii
Hordern, Mason & Edwards, Ltd.	ix	Zinc Alloy Die Casters Association	xxvi

Page

—

xviii

—

vi

xlii

—

xxiii

—

—

—

—

—

1

xxviii

—

—

v

—

—

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xxviii

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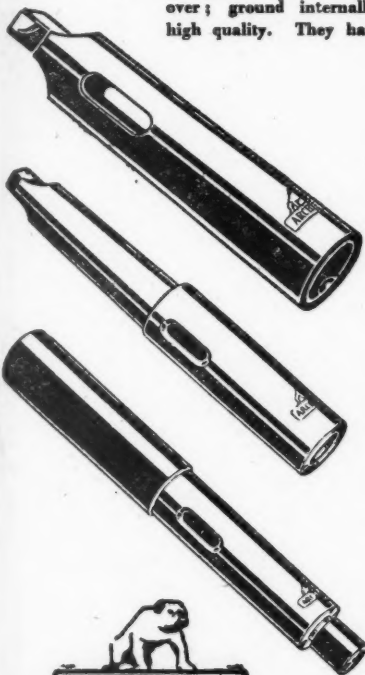
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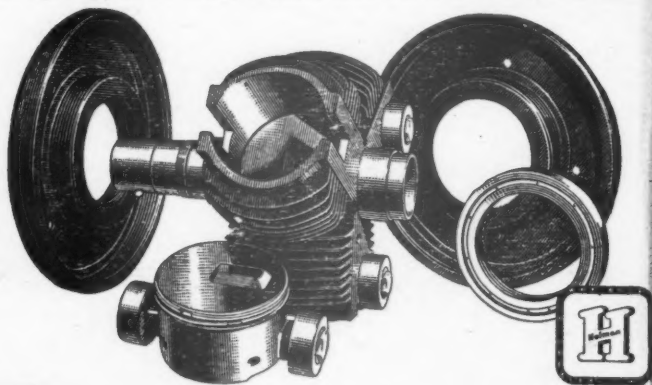
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